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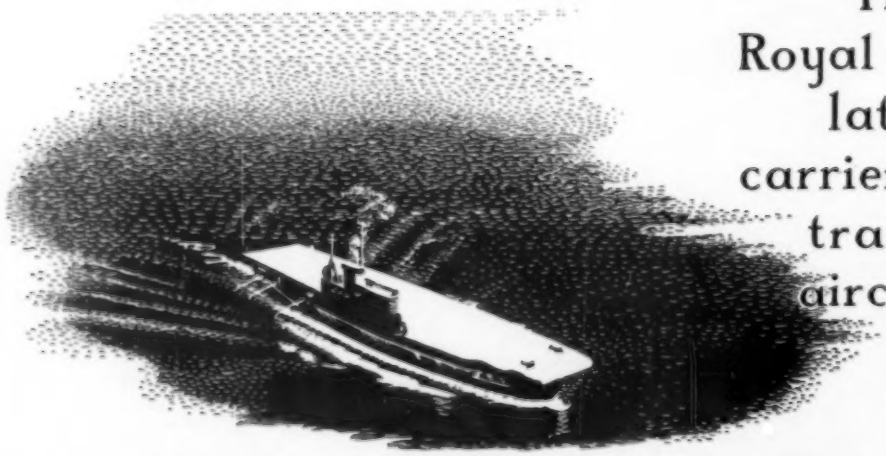

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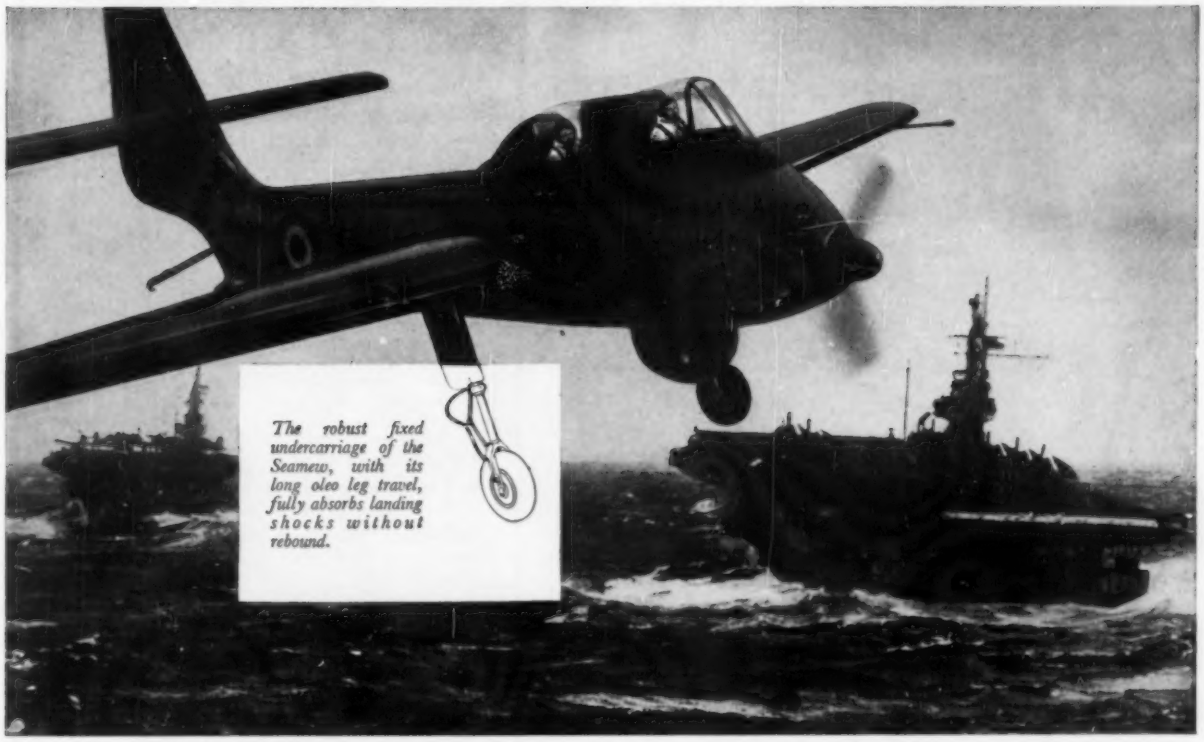

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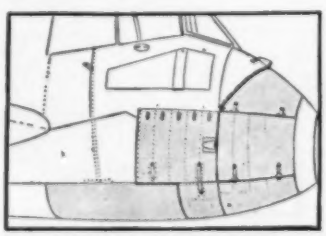

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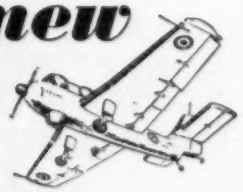

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1 **Main Road.**
2 **Existing airport buildings.**
3 **Aircraft awaiting take-off clearance.**
4 **Construction area for new airport buildings.**
5 **Aircraft taking off, seen on three successive rotations of the Scanner.**
6 **Radar site on top of control tower.**

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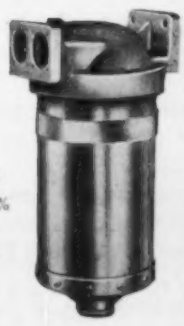

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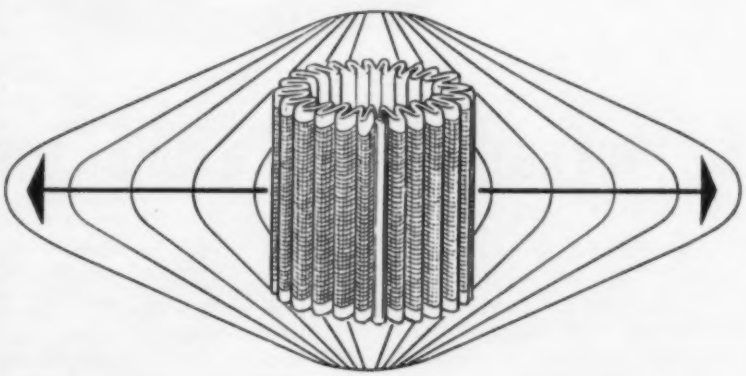

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Tailor-made

WHEN a well-dressed man wants to order a new suit he visits a tailor and selects a pattern. He himself is the guide to size and shape, and he indicates the occasions and climatic conditions for which the garment is to be suitable. The tailor's reputation (if it is a good one) will then give the guarantee of quality, cut and workmanship. A few extra visits are made for fitting, and in due course a smart, serviceable product will result—one which can accommodate a good deal without bulging or sagging under the strain, and which will in time permit some stretch before its useful life is over. All this is well known, but it is worth repeating here because, with only a few words altered, it applies equally well to the ordering of a new aeroplane, a process not, apparently, so well understood.

Aircraft, to be really successful, must be tailor-made for their jobs, and this calls for full co-operation from start to finish—*and* after delivery—between maker and customer. Admittedly, in this case it may be the "tailor" who approaches the customer with a view to providing the new equipment he will need.

This subject of all-through co-operation has been stressed by a number of people through the years, and recently we have heard the points re-stated by Sir Arnold Hall and Mr. Peter Masefield. Within the last few weeks, also, the Duke of Edinburgh has expressed similar sentiments; in his British Commonwealth and Empire Lecture he had divided aviation into three sections, Service, airline, and others, and was devoting his attention to the third category. His actual words were, ". . . when the Beaver was first mooted, the makers went to considerable trouble to find out exactly what the bush pilots of Canada really wanted, and throughout its development their opinions, experience and criticisms were sought and used. . . . The secret of success seems to be the very closest co-operation between the makers and the operators."

How many people, when marvelling at the success story of the Douglas DC-3 through its years of multifarious duties, give some credit also to T.W.A., the company which sponsored the design and co-operated from the start in its development and introduction to service? This was an early (and, in its outcome, impressive) example of maker-customer co-operation.

There are, of course, standard sizes—to carry our tailor metaphor a stage further—and some operators, particularly those with limited resources, do very well by taking a ready-made, part-finished design off the peg and having it altered and finished as required for their needs. The result is usually satisfactory, without perhaps being ideal.

Predominantly concerned with civil aircraft, our remarks nevertheless apply very forcibly to military machines, the majority of which are even more one-purpose than their commercial relatives. It has been hinted during the last few months that co-operation between the manufacturers and the fighting Services could have been better, and that shortcomings, from the R.A.F. point of view, could have been eradicated from new aircraft earlier. Again, there are still signs that the three bodies most concerned have paid too little attention to producing efficient, fully-equipped fighting machines for the squadrons. A beautiful flying machine is not enough, and it is the unhappy truth that many of the new aircraft in service, and most of the prototypes, are flying without a full complement of military equipment. The "black boxes" are all too scarce and late in delivery. We should add that these, too, have to be considered from the start, for today they are integral parts affecting the main systems and structure—a far cry from the old course-setting bomb-sights that went out to the aircraft under your arm.

Reverting to the lecture by the Duke of Edinburgh and to his third class of aircraft, it is timely to reconsider the requirements of outback aviation. The British aircraft industry has had its plate full in trying to meet the needs of the airlines and air forces, and only now is it starting to be able to consider specialized agricultural aircraft, bush transports and light passenger machines. It is, however, high time that this great potential market was tapped and British designs offered, from Auster size up to that of the H.P.R.3. Few doubt that great opportunities exist or that the air pioneering efforts outlined by the Duke will be much increased. Actively to further this fine work by building the special aircraft required to do it efficiently is no longer just an act of faith; it is good business.

FROM ALL QUARTERS

Return of M.A.P.?

SPECULATION as to whether the wartime Ministry of Aircraft Production may in some form be revived was caused last week by a remark which the Prime Minister made in the House of Commons.

Following the concern expressed by members during the previous week [*Flight*, page 888, December 24th] further questions were being asked about the rate of delivery of new fighter aircraft. Sir Winston Churchill rejected an Opposition suggestion for a committee of inquiry into the supply of civil and military aircraft. He said he was shy of entrusting a matter of great intricacy to "some sort of committee." He thought that the production delays, which had occurred because of accidents, too few prototypes and unfortunate events here and there, would not work out to Britain's disadvantage. He believed they would be settled and result in a satisfactory flow "before the period of comparative safety in which we are living has elapsed."

Explaining the arrangement by which the Services obtained their aircraft, the Prime Minister said that the functions of M.A.P. had been transferred to the M.o.S. by the Labour Government in 1945 and had been continued by the present Government; the M.o.S. provided a common service for the Admiralty and Air Ministry in the development and procurement of aircraft. Co-operation between the three departments was intimate and continuous.

Mr. Woodrow Wyatt (Lab., Birmingham, Aston) suggested that in view of the "appalling delay" in deliveries, the system should be completely overhauled; no one seemed to have the power to make a decision when to cease making modifications and when to begin actual production.

It was from Sir Winston's reply to these remarks that the speculation arose. He said that these matters were being urgently considered and examined; the greatly increased complexity and an extraordinary rapidity of development of aircraft was such that their life in the process of construction far exceeded the "life" of an individual Minister of Supply. With all the preparations involved, it might be twice or thrice as long. All this had to be considered, and that had raised in his mind the question whether a special Ministry ought not to be re-created to deal with the prolonged process of production.

The Swift Situation

IN a written reply to Mr. Langford-Holt on December 20th, the Minister of Supply, Mr. Selwyn Lloyd, stated that the Mk 1 and Mk 2 Swift fighter aircraft had been cleared for introduction into service, subject to certain limitations. Development of the later marks of Swift, said Mr. Lloyd, was continuing, but the position generally was under review.

Mr. Langford-Holt's question followed an unofficial report that the Swift 1 and 2 were forbidden to fly above 25,000ft as a precautionary measure during "evaluation" tests with No. 56 Sqn.

BIG FLAT-TOP: U.S.S. "Forrestal," referred to on this page, is the largest warship ever built. Since this photograph was taken, a little over a fortnight ago, it has been decided that her 140-ton island superstructure shall be moved 22ft farther from the centre-line to provide more deck space. The modification will cost £400,000.

Super Carrier

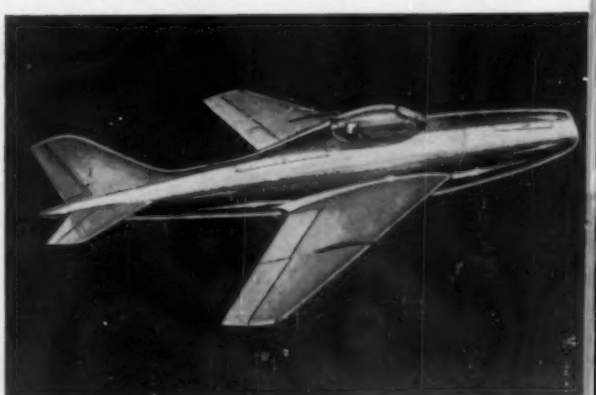
FIRST of ten giant carriers to be built by the U.S. Navy, U.S.S. *Forrestal* was launched at Newport News Dock, Va., on December 11th by the widow of James V. Forrestal, the former Navy Secretary. The vast ship is now fitting-out in Hampton Roads, and is scheduled to enter service, with her air group, early in 1956.

The new carrier has about four acres of flight deck, made of 1½in steel integral with the hull. The ship was to have been entirely flush-decked, but has been completed with a massive superstructure "island." The hangar deck is very large, and is designed to handle such heavy and complex aircraft as the A3D Skywarrior. Four lifts are fitted, each being of the edge type with a 166-ton capacity and a platform 55ft by 62ft.

The deck is, naturally enough, angled at about 12 deg. There are four steam catapults, two firing out over the bows and the other pair at the front of the angled deck, which has a 55ft overhang on the port side. All four catapults can be used simultaneously. The arrester gear is of a new hydro-pneumatic type capable of bringing to rest in 150ft a 70,000 lb aircraft touching at a speed of 100 m.p.h. over the deck.

Forrestal is to carry a complement of 3,500, including embarked

ITALIAN RENAISSANCE: In the years before the late war light fighters were developed in Italy as well as in Great Britain and France, and the Piaggio company acquired the licence for a version of the Blackburn Lincock. Now interest has revived with the development of the Fiat G.91 ground-support aircraft (left), fitted with a Bristol Orpheus, and the Aerfer-Ambrosini-Stefanutti Sagittario II (Rolls-Royce Derwent 9).



***NOSE-FULL OF EYES:** This is the first air-to-air photograph of the Lockheed RT-33 single-seat photo-reconnaissance aircraft now in quantity production against M.D.A.P. contracts for European air forces. The nose carries no guns, but houses a battery of vertical and oblique cameras; in addition, the pilot has a wire-recorder, for verbal descriptions of target areas. This is the latest—and possibly the final—production version of the Shooting Star of 1944.*

air group personnel. She will be able to handle 125 aircraft, many of them of Skywarrior size. Her length is 1,036ft, and the maximum beam is 252ft—certainly exceeding that of any existing vessel. Her displacement will be of the order of 59,600 tons unladen, rising to almost 70,000 tons in fighting trim. Her propulsion machinery will develop 200,000 s.h.p., giving a speed of about 30 knots. No details of her armament have been released.

The U.S.S. *Forrestal* will be CVA-59. The next ship, CVA-60, U.S.S. *Saratoga*, is building at the Brooklyn Navy Yard; CVA-61, *Ranger*, is also being built at Newport News, and CVA-62 will be built at Brooklyn. A fifth will be budgeted for in 1956.

Orpheus Running

WITHIN a year of the start of the detailed design, the Bristol Orpheus lightweight turbojet has started its running trials —an achievement upon which the designers and workers responsible are to be warmly congratulated. In the preceding twelve months all major components were subjected to rig-testing, and much of the development work normal to all new engines accomplished. The remarkably low measured weight, say the manufacturers, is an improvement upon the first design estimates, and has been obtained without any sacrifice in life or reliability.

It is emphasized that the Orpheus was not designed as an expendable unit, being intended, as is well known, for the Folland Gnat and other light fighters, and for trainers or comparable types, requiring a medium-thrust lightweight turbojet. The Orpheus has already attracted interest among constructors outside this country.

The Hunter's Pedigree

WITH production of the Hawker Hunter F.1 (Rolls-Royce Avon) and F.2 (Armstrong Siddeley Sapphire) well advanced for the R.A.F., newer models are being studied or are already under active development. Others, such as the F.3, which was to have been powered with a reheat Avon, have already been abandoned, as research and development have progressed, though it will be recalled that a converted Hunter F.1 with a reheat Avon RA. 7R set up a world speed record of 727.6 m.p.h. on September 7th, 1953. The newest version in large-scale production is the F.4, with a late mark of Avon and various internal improvements, the nature of which may not at present be specified. It it likely that this version will be supplied not only to the R.A.F. but to overseas governments.

Although referred to by the commentator at Farnborough as the "Hunter 6," the machine demonstrated by Neville Duke this year was, to be absolutely accurate, an earlier type, leading up to the Mk 6. The airframe was essentially that of a Hunter F.1, adapted for an advanced type of Avon (with a thrust, it might be supposed, of the five-figure order), and the makers preferred to call it "Hunter variant."

Vickers-Armstrongs Reorganization

FORESHADOWING a reorganization in the Vickers-Armstrongs group, the formation of three subsidiary companies was announced last week. They are to be known respectively as Vickers-Armstrongs (Aircraft), Ltd., Vickers-Armstrongs (Engineers), Ltd., and Vickers-Armstrongs (Shipbuilders), Ltd.

At the same time, a number of changes in the board of Vickers, Ltd., were announced. Details appear in "The Industry" (page 950) section of this issue.

Projected by Napier

ACCORDING to American reports, D. Napier and Son, Ltd., have "worked up a project study" for a medium-range transport powered by four of the forthcoming Eland 4 turboprops of some 4,000 h.p. each. The British company are quoted as holding the view that any new airliner must have a substantial speed advantage over the aircraft which it replaces, and that cruising speeds above 400 m.p.h. must be looked for.

The Napier suggestion is for an orthodox machine with a low wing, 119ft in span and with an aspect ratio of 9.5 and a gross area of 1,500 sq ft. The fuselage would have a length of 114ft (the same as the Britannia 100) and a diameter of 12ft (also the same as the Britannia), and would certainly be fully pressurized. The maximum gross weight is given as 100,000 lb, thus making the project rather heavier than what has been published as current Vickers-Armstrongs thinking in this field. The payload would be up to 25,000 lb over sectors of up to 1,500 miles, and the cruising speed would be in the 420-437 m.p.h. band at all heights down to about 10,000ft.

The characteristics of the design would be such that optimum economy would be attained on stages from 500 to 1,500 miles—and the vast majority of airline routes involve sectors within these limits.

Missile Secrecy Criticized

SECRECY surrounding Britain's progress with guided missiles was criticized recently by Air Chief Marshal Sir Guy Garrod, chairman of the Air League of the British Empire. In a broadcast he said, "Very little is known or has been published of our achievements with guided missiles. We know quite a lot about what Russia is doing [the Air Marshal is singularly fortunate in this regard—Ed.] and it is quite indefensible that more information should not be given to the public of our achievements in this field."

Air Chief Marshal Garrod recalled that Britain started well behind America in the development of guided missiles, and he believed that we were now not very far behind. He went on to declare, "All this money is being spent on defence and the public is not being taken into the confidence of the Government. More should be announced to the public. I see no reason why it should not be done; we deceive ourselves if we think that the potential enemy does not know how far we have got with guided missiles."

***NEW ANGLE** on the Fairey Rotodyne is brought out by this latest picture of a model (supported by John W. R. Taylor of Fairey's London office). Two prototypes are being built, both powered with special derivatives of the Napier Eland turboprop.*

OUTBACK AVIATION

The Duke of Edinburgh's Commonwealth and Empire Lecture

His Royal Highness the Duke of Edinburgh, K.G., K.T., the Royal Aeronautical Society's tenth British Commonwealth and Empire lecturer.

IN Church House, Westminster, on December 16th, the Tenth British Commonwealth and Empire Lecture was given before the Royal Aeronautical Society by His Royal Highness the Duke of Edinburgh, K.G., K.T. The subject of his paper was *Aviation and the Development of Remote Areas.*

In his introduction, the Duke outlined his own experiences of flying and went on to divide aviation in general into three divisions. These were Service flying, scheduled airline operations and "the rest, which is in fact largely made up of aviation in the outback of the great countries of the world."

"Broadly speaking," he continued, "in the United Kingdom there are 5,000 aircraft in the Air Force, 639 airliners, and 1,618 others. In Canada there are 2,000 in the Air Force, 285 airliners and 2,409 others. In Australia, 1,000 aircraft in the Air Force, 185 airliners and 634 others. New Zealand has 200 aircraft in the Air Force, 44 airliners and 416 others. South Africa has 300 in the Air Force, 44 in airline work and 441 others." It was a consideration of the 5,500 aircraft in the last division, and the present position and future prospects in this field, that was to form the basis of the paper.

The Conception of Aviation in the Outback. "During the recent tour of Australia and New Zealand and then later in Canada," the Duke said, "I had a wonderful opportunity to hear about, and sometimes to see, the enormous variety of uses other than passenger-carrying to which aircraft have been put in these countries. It is not perhaps surprising that they have found so many uses for aircraft, considering the conditions. Australia and Canada are enormous countries by any standard and although New Zealand is not much bigger than the British Isles, the population is about 2½ million compared with roughly 50 million in these islands. The distances involved alone make aircraft the obvious choice for general transport. In this country all forms of aviation and transport are bedevilled by chancy weather, to say the least of it, while Australia, New Zealand and Canada are blessed with relatively good flying weather for most of the year. In fact, services in Australia work to a 98 per cent regularity. On top of that the attitude to flying in those countries is quite different. It is part of their life and not in the least restricted to the relatively few people who go abroad regularly, as it is to a large extent in this country.

"Aircraft and the men who fly them occupy quite a special place in the minds and affections of the people who live in remote districts. For instance, the pilots of the aircraft engaged in the outback services in the Northern Territory of Australia are doing by air, with all the added difficulties, what the carriers and bus drivers are doing in the rural areas in this country." In case pilots took exception to this comparison, the Duke added, it should be mentioned that in a recent article in *Flight*, also, the Beaver had been compared with a country bus. [The article referred to was *Beaver Service*, by Robert J. Blackburn, November 19th.] "The pilots are required to service their aircraft, repair minor defects, refuel, collect fares, issue invoices for passengers and freight, and do the loading and unloading. In addition, they are expected to run to a strict schedule, navigate over poorly mapped areas which they must know well, land and take off from a great variety of bush airfields under varying weather conditions. . . .

"Many things are quite reasonably done by aircraft out there which would be the height of extravagance or folly in this country. In many cases, of course, aircraft are used not because it is easier, quicker or cheaper, but because there is no other way.

"Distances, weather and the absence of other facilities, therefore, make aviation a vital and integral part of the civilisation of those countries and no longer an interesting novelty, or a convenience for the relatively few . . ."

Aircraft in Agriculture. Under this heading the lecture continued: "Aircraft are being used for crop-dusting, which is really a form of pest control, for seeding, top-dressing and for the survey of land and in forestry . . . Top-dressing is a speciality of New Zealand and the object of the exercise is to drop fertilizer on to otherwise inaccessible pasture land to improve the grass to feed sheep. It is important to remember that this is not an alternative way of doing it—it is the only way. Top-dressing is done by air or not at all. I do not think that there is any doubt about its usefulness. Let me give you some figures. On a 900-acre block in the Auckland district, with two seasons of top-dressing with four to six hundredweight of phosphate and potash per acre, the capacity of the block has been increased from 1,200 to 2,300 ewes, and it is hoped to increase that to 3,000 in the next two years. Throughout New Zealand there were twelve aircraft employed on top-dressing in 1939. That figure has now risen to 162. In 1953 they distributed 140,000 tons of fertilizer over 1½ million

Fig. 1. Division of Commonwealth Aircraft.

	AIR FORCE	AIR LINES	OTHERS
United Kingdom	5000	639	1618
Canada	2000	285	2409
Australia	1000	185	634
New Zealand	200	44	416
South Africa	300	44	441

Fig. 2. Value of aerial top-dressing in New Zealand.

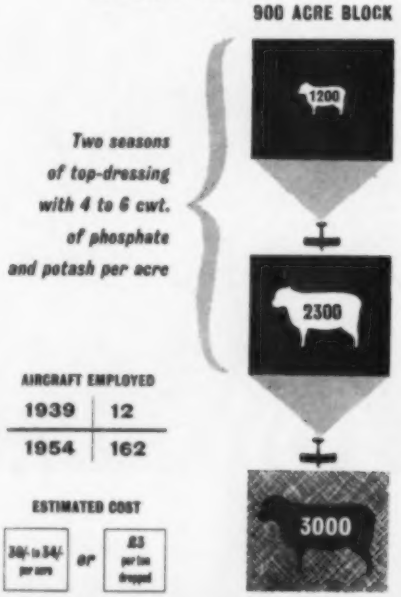


Fig. 3. Light aircraft versus locusts in East Africa.

acres. Some people estimate that aerial top-dressing is capable of increasing meat production in New Zealand by 50 per cent in ten years, and the ultimate target is to treat ten million acres of hill country.

"To give some idea of the cost of this work, it is estimated that counting fertilizer, transport, dropping, interest on capital, etc., it works out at between 30s and 34s per acre, or some £3 per ton dropped. The latest development is a product consisting of a hormone and a superphosphate for the dual purpose of weed-killing and fertilizing.

"Apart from top-dressing, aircraft are used to spread trace elements (this is done commercially in New Zealand for between 6d and 1s per acre), for sowing seeds, dropping fencing and other supplies such as fodder and poison bait, and frost protection of valuable crops. In America it is estimated that aircraft used for agricultural purposes—and there are 7,000 of them, compared with 65 in Western Europe—spend 55 per cent of their total flying time in pest and disease control, 35 per cent in seeding and fertilizing, and ten per cent in photographic survey for erosion, pest infestation and for planning irrigation works . . .

"Whatever purpose aircraft are used for there is one fundamental rule; the aircraft must be employed all the year round to make it worth while. The whole difficulty of operating aircraft for agriculture lies in finding a variety of uses which will achieve this ideal."

Aircraft in Pest Control. There were, continued the lecturer, many sides to pest control from the air, but they were mostly alternatives to ground methods. In Africa, however, aircraft were used for locust control and in this case there was no alternative which was anything like so effective. For every pound spent on aerial spraying of locusts, crops up to the value of £110 could be saved. "In 1954," said the Duke, "a battle was fought in East Africa by ten light aircraft, operating from a 600-mile line of bases in Kenya and Tanganyika, against an invasion by some 50 swarms with a total area of about 500 square miles and containing something like 50,000 million locusts—weighing, perhaps, 100,000 tons. This time the locusts won, although many large swarms were attacked in flight and several were completely destroyed. During the battle it was found that 300,000 locusts can be killed by one gallon of poison sprayed from aircraft at a cost of £6 per million locusts killed.

"Also in Africa, aircraft are used against what is probably the greatest obstacle to development of that continent. In Tanganyika alone, 75 per cent of the total land is unsuited for settlement because of the tsetse fly. They could be wiped out from the air, but at present it takes three applications, and that is still rather expensive.

"Almost every country in the Commonwealth and Empire can provide examples of the use of aircraft in pest- and disease-control. Forests are surveyed to find infected areas, and in Canada budworm in forests have been attacked with D.D.T. with great effect.

"The most important and effective way of controlling pests and diseases, if good husbandry and good sanitation prove inadequate, is by the use of poisonous chemicals. The immense development of potent new chemicals in recent years has meant that only from one to 25 gallons of spray per acre are required, where 100 to 3,500 gallons would have been necessary a few years ago. In fact, the low dosages at which the new chemicals are effective have been directly responsible for the increased use of aircraft for the control of pests and diseases in the last twelve years. The essential quality of aircraft that suits them for this work is their independence of the nature of the countryside, which enables them to reach standing crops, deserts for locusts, tree-tops for forest pests and swamps breeding mosquitoes—places that would be inaccessible to ground machines—and to treat infested areas with a speed quite impossible by any other means.

"Another method of dealing with pests is by biological control. This means spreading harmless insects which will live on the pests and reduce their numbers. This sort of thing can be done most efficiently by air; in fact, it can also be done unintentionally, with harmful results. For instance, before starting the South Africa to Australia air service it was discovered that there were 52 varieties of pests which existed in South Africa but not in Western Australia, and which were liable to be transported inside or outside the aircraft on that route."

Aircraft in Surveying. "Considering the immense size of Canada, Australia and Africa, and the large proportion of unexplored country," said the lecturer, "it is not surprising that aircraft are used extensively in the survey of vast areas of unknown country. These surveys are made for a number of reasons apart from ordinary map-making. In Africa, 30,000 square miles were mapped for the purpose of choosing the best route for a projected railway line; 16,000 square miles were mapped in the Gold Coast for a hydro-electric scheme; and in Northern Rhodesia 11,000 square miles have been looked at for a possible extension of the copper belt. In India 180,000 square miles have been photographed for the survey of India. In Pakistan, under the Colombo plan, 300,000 square miles are to be photographed for geological and irrigation survey purposes.

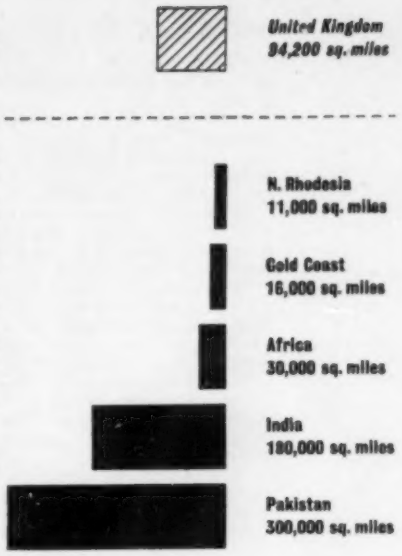


Fig. 4. Commonwealth areas surveyed (for a variety of purposes) by air, relative to the area of the United Kingdom.

"Probably the most important aerial surveying is done for geological reasons. Aerial prospecting is indispensable in Canada and Australia and many interesting techniques have been developed. Geological interpretations of photographs, measurements of the Earth's magnetic field, measurements of electro-magnetism and measurements of radio-activity all play their part in laying bare the hidden resources of those great countries.

"Allied to geological surveys are the aerial soil surveys over country otherwise inaccessible, or where the use of land changes rapidly. Over- or under-developed land and soil erosion are quickly detected in photographs and volumes of timber per acre can be estimated with fair accuracy. Canada has led in the development of the technique of assessing the composition, wealth and best logging plan for her vast forests, using stereo-examination of photographs combined with ground work.

"The great attraction of aerial surveying, for whatever purpose, is the speed at which it can be done, and hence the tremendous amount of time saved. For instance, before building the hydro-electric plant at Kitimat, in Western Canada, it was necessary to find the best route for a 50-mile power line across mountains 5,000 feet high. By any other method the survey would have taken three years but, using helicopters, the work was completed in thirty hours' flying. Or again, the survey of the Frazer River Canyon in British Columbia, which took five years on foot, was completed in one season from the air.

"As early as 1923 aerial survey was used in Canada to sketch waterways, lakes, rivers and areas of burn and merchantable timber. The cost was ½ cent per acre against 2½ cents for ground reconnaissance and it was done at the rate of 36 square miles an hour."

Aircraft for Freight. Turning to this aspect of his paper, the Duke said it could be generally assumed that aircraft were not employed on jobs which could be done more cheaply by other means. In the moving of freight, however, a whole host of complicated problems made the issue rather more difficult. He did not propose to deal with express air freight because, from the aircraft point of view, it was not so very different from passenger-carrying.

"For many years," he said, "there has been a tendency in this country to think of air freighting as rather expensive and unnecessary. This is not altogether surprising considering the difficulties of weather, short distances and, in the early days, the relative lack of funds available to the aviation industries. There are now, I am glad to say, many welcome signs of growing interest in the rapidly expanding market for air freight.

"Development was very different in Canada, for example, where as early as 1937 Canadian aircraft carried 24 million pounds of freight, compared with 9½ million pounds lifted by United States carriers in 1939.

"Air freight opened the Canadian North in the twenties and thirties and every further development in that area depends entirely on aviation. Take, for instance, the Eldorado uranium mine at Port Radium on the Great Bear Lake, less than 30 miles south of the Arctic Circle. In the first place it was discovered by Gilbert Labine in 1930 from the air in an aircraft flown by C. H. ('Punch') Dickens, a famous name among the bush pilots of Canada.

"The mine at Port Radium is entirely supplied by air from Edmonton, 1,200 miles away, except for particularly large or heavy equipment. The Eldorado Company also looks after another establishment at Beaverlodge, 350 miles from Edmonton. The Company operates one Dakota and one Curtiss Commando which, between them, lift on the average 3,000 passengers and about 3,000 tons of freight every year. A total of roughly 2½ million ton-miles at a cost of 22½ cents per ton-mile. The only other transport system is by water, and although this is considerably cheaper—it costs $80 for every ton taken to Port Radium compared with $225 per ton by air—navigation to Port Radium is only open for one month and to Beaverlodge for four months in the year. Therefore, allowance must be made for the cost involved in carrying large inventories of waterborne freight and equip-

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ment. In fact, the water route is only used to bring out the products of the mine.

"The figure of 22½ cents per ton-mile becomes rather more interesting when it is compared with the cost of road transport over comparable distances in Northern Canada, which is, at a rough estimate, about 15 cents per ton-mile, although the average for the whole of Canada is only 5½ cents per ton-mile.

"Two of the reasons why this company can operate at such a relatively low cost are that both aircraft were picked up cheaply as war disposal, and the large back-haul of passengers and concentrates which make for the high load-factor of 90 per cent.

"The important point here is that these establishments, thanks to aircraft, are in no way cut off from the outside world. Since fresh food and vegetables, newspapers and books can be flown in all the year round, the community—which includes several families—lives a normal full life.

"To pass now from Canada to Australia, where an experiment has been running some six years on the flying of beef from a cattle station to the coastal port. These cattle stations can be up to five million acres in extent and 500 miles from the nearest railhead or harbour.

"The experiment was started by Air Beef, Ltd., who established an experimental abattoir at Glenroy, some 180 miles inland from Wyndham in the north-west corner of Western Australia, with a capacity for dealing with 60 head of cattle per day or 300 a week. During the six years an average of 4,000 head of cattle per annum have been killed and the result has been to upgrade the meat from 23 per cent export quality to 65 per cent export quality, and total frozen carcass weight has gone up 13 per cent. Before the introduction of Air Beef only about 7 per cent of the cattle raised ever reached the meat works. Although the value of the meat has only gone up by 34s a head, the increased production of meat has increased revenue by over 200 per cent. The number of cattle marketed from that station has doubled and the station has been enormously improved by the increased income and by using the aircraft to transport to the station all the equipment required for development. Air Beef, Ltd., operate one Bristol Freighter.

"The possibilities for Australia are immense. It has been estimated that by using inland abattoirs and air freighting, beef production in Australia could be doubled in ten years. When you think that, before, some herds of cattle had to walk those distances, it is understandable why so many arrived in a somewhat dim condition at the other end.

"There is one other use for air freight I would like to mention. It is in connection with the giant construction jobs in remote districts. Early this year a 350-mile railway from the St. Lawrence to Knob Lake on the border of Quebec and Labrador was completed to carry iron ore. This railway is capable of carrying trains weighing up to 10,000 tons. The railway was built principally by air. Using six landing strips, men, equipment and food were flown to work on various sections of the line. I have already mentioned that helicopters were used to survey the route for the power line from Kemano to Kitimat. I think it is worth mentioning here that the line was also built with the use of helicopters, which carried every man and piece of equipment to remote spots up to 5,000ft above sea level."

Aircraft for Other Uses. There were one or two other fields which did not fall into any category but which ought to be mentioned, the lecturer went on.

There was the Flying Doctor Service in Australia, which had made such an enormous difference to life in the outback. "I am not going to describe the organization," continued the Duke, "except to point out that the pilot has a lot of problems which normally do not apply. The mere fact that weather or airfield conditions are such that normal flying would cease does not matter very much when a life is at stake. The pilot often has to make a decision, knowing that if anything happened to the aircraft it would not be covered by the insurance. Emergencies are much more likely to occur after floods or storms, just when airstrips are at their worst. Night flying is not possible at present, so there is the added hazard of not getting back in time and having to make a forced landing in the desert. The Flying Doctor Service is a wonderful achievement, but flying the doctor is no 'piece of cake'.

"In the exploration for, and the production of, oil, Shell have five aircraft in British Borneo which are used to carry staff between oilfields, camps and the nearest major airport at the rate of about 1,000 a month. Journeys which would take 14 to 20 hours on the ground are done in 50 minutes by amphibian.

"Quite apart from the practical advantages, the moral effect on staff of the ability to extricate casualties from difficult places and get them quickly to hospital has been one of the most welcome results of using aircraft. For instance, a suspected typhoid case was in the main base hospital within five hours of the emergency message being received. The outstation was 200 miles away and the surface journey would have taken 24 to 36 hours.

"Much as I would like to say something about the private owner and flying for fun, I am afraid that the subject is altogether too big and complicated to be dealt with here.

Fig. 5. The Eldorado uranium-mine project at Port Radium, in the Canadian North, almost all supplies for which are transported by air.

"In spite of the claims I have made for the contribution of aircraft to the progress of civilisation, I must admit that there are other uses not quite so Utopian.

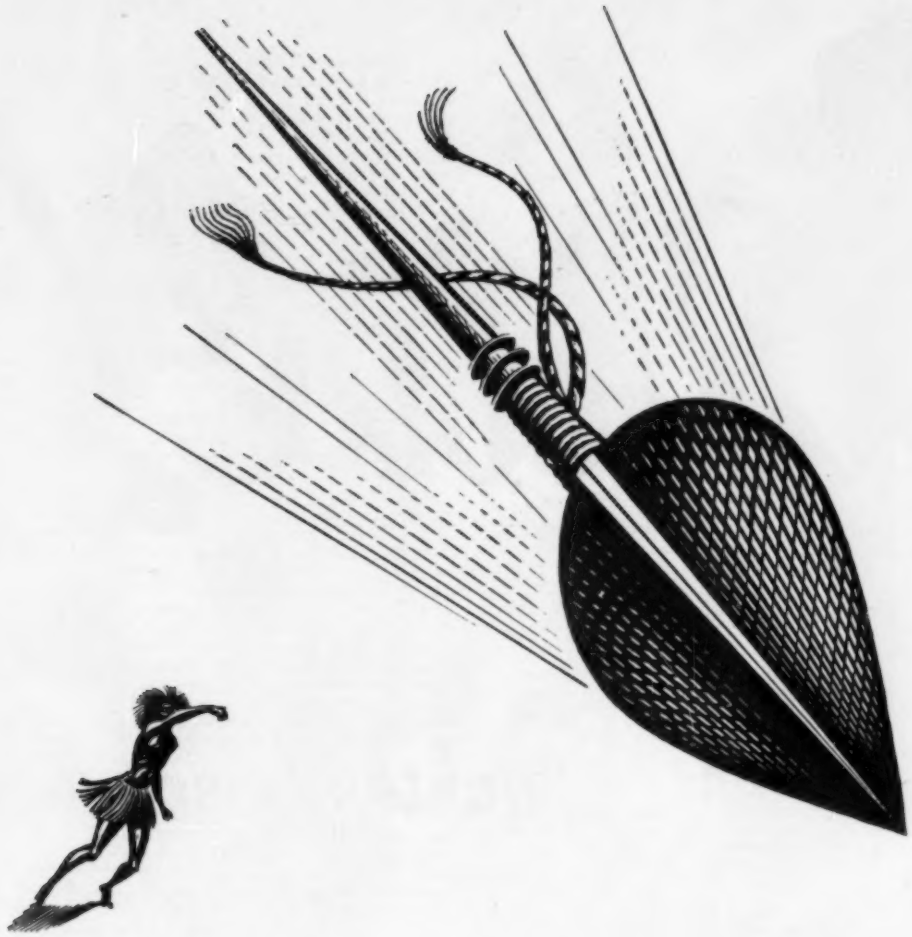
"At Yellowknife in Canada this year, a man succeeded in pinching two gold bars, which he put in his kit bag. He then hired an aircraft and flew off to Edmonton and vanished. The story goes that the pilot helped him to lift his bags into the aircraft and that when he felt the weight he is supposed to have said: 'What have you got in there—a couple of gold bricks?' "

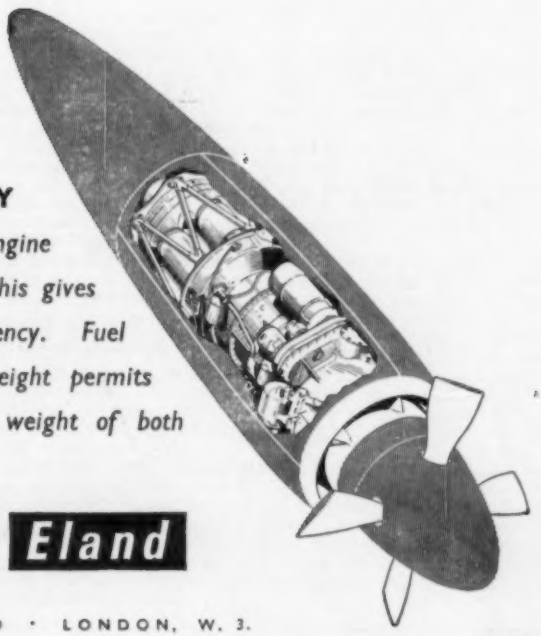
Helicopters. The lecturer said he had avoided the subject of helicopters in any great detail because the relative expense at present put them out of the reach of most people. "However," he continued, "now that they have caught the imagination of the public and official mind I have no doubt that their development will not lag through lack of interest or funds. Neither does it need a particularly vivid imagination to think of the uses for helicopters, once they can be produced reasonably cheaply.

"I also do not wish to become involved in an argument about the use of helicopters, but judging by present trends it looks as if this country particularly could benefit from their characteristics. Fixed-wing aircraft are ideal for agriculture, pest control and survey so long as the geographical scale of countryside is large. When it comes to dealing with small, detailed work, which is the rule in this country, then the helicopter is the only really useful type of aircraft for that purpose. In fact, the greatest part of air spraying in this country is done by helicopters and some thousands of acres of potatoes are sprayed by helicopters each year."

Requirements. There were, said the lecturer, several conclusions to be drawn: "The first and most important is that, apart from the Bristol Freighter and the Beaver, and later the Otter, not one single aircraft used in any of the fields I have mentioned was actually designed for the job. Every sort and kind of aircraft are used, from Moths to Dakotas and they are all old and were all designed for something else. It is like using a double-decker 'bus as a milk float, or a Bentley as a farm tractor.

"It is also perhaps interesting to note that both the Freighter and the Beaver were private ventures, the latter being designed and built in Canada. I may be wrong, but so far as I know the only aircraft on the stocks which falls into the category I am discussing is the Twin Pioneer—known to some as the 'Double Scotch.' This





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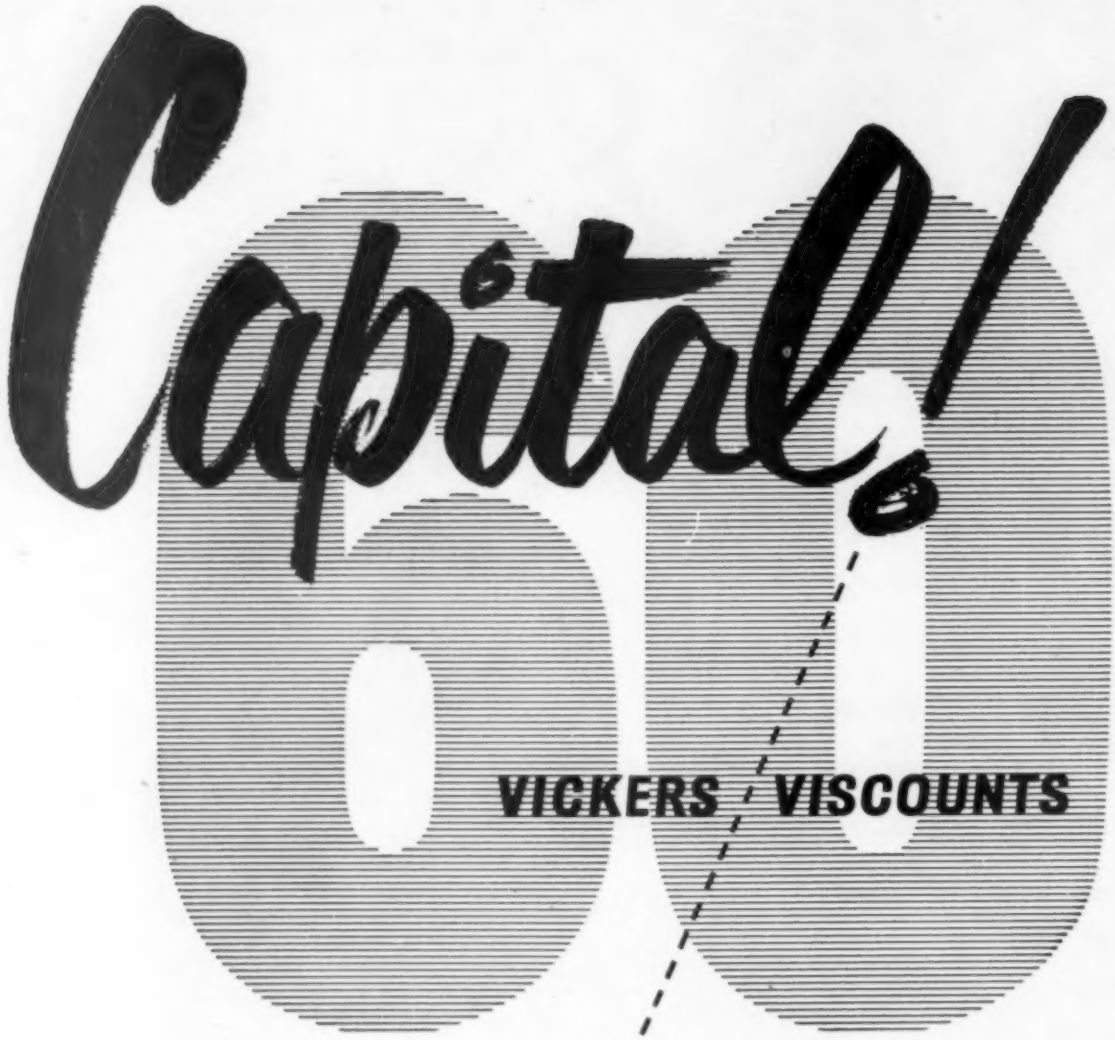

FITTED WITH

DUNLOP

TYRES, WHEELS, BRAKES

& MAXARET ANTI-SKID UNITS

The twenty additional Vickers Viscounts ordered by Capital Airlines Inc., of Washington, D.C., brings the number of these aircraft sold to this airline to 60, in value the largest post-war dollar order obtained by a British Company. The number of Vickers Viscounts sold in the North American continent now totals 83—all Dunlop equipped.

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started as, and is still, substantially, a private venture; it was designed and is being built by a company that has only produced one type of aircraft previous to this effort. I think it is worth remembering that when the Beaver was first mooted the makers went to considerable trouble to find out exactly what the bush pilots of Canada really wanted, and throughout its development their opinions, experience and criticisms were sought and used. The result is an aircraft which they like and use; 113 Beavers and 51 Otters are in use in Canada already. Not unnaturally, these aircraft are in demand outside Canada also.

"Several attempts are being made to produce a DC-3 replacement, notably the Herald in this country, but it is not an easy thing to do, because the DC-3 will only be replaced by an aircraft which is better in all respects and, most important, considerably cheaper to operate.

"The secret of success seems to be the very closest co-operation between the makers and the operators. That co-operation exists in development of airliners, it is not always present in the development of aircraft for the outback . . ."

A "flying tractor" type of aircraft had been built in America and was expected to cost between £5,000 and £6,000: "Trials already indicate that, using this specially designed aircraft, the operating cost of chemical application is roughly half that of the cost of the best existing aircraft converted for the purpose. The other interesting fact is that a third of these aircraft to be built will probably be sold to New Zealand. I have also heard that more than one British aircraft company is giving careful attention to the needs of New Zealand's top-dressers and aerial agriculturalists."

From Australia, the Duke continued, it had been reported by the operations supervisor of Connellan Airways, who ran the Flying Doctor Service there, that the difficulty faced by bush airline operators was the lack of a suitable type of aircraft. The Eldorado Aviation Company of Canada had also stated that there was no new aircraft available which met their requirements—a problem common to all operators serving remote areas in Canada.

"So far as the British aircraft industry is concerned, out of 687 aircraft of 64 different types employed on bush operations in Canada in 1953, only 46 were built in this country and only 4 were built after the war.

"Quite obviously this is only one side of the picture and no one would deny that the makers have their troubles and difficulties too. After all, even pilots and operators are not well known for being able to state and stick to their requirements, although they can be relied on to say with considerable emphasis what they do not want. But the fact remains that aircraft are needed for these operations, that aircraft will be used for these operations, and that somebody has got to make them.

"There can be no doubt that aviation is an essential element in the development of the Commonwealth and Empire. Hence it follows that aircraft must be designed for the jobs for which they are required, or the aircraft must be highly versatile; that, whatever the job, the aircraft must be simple, robust and easy to maintain; that speed is a secondary consideration, for the simple reason that even if they only flew at 30 knots they would still get to places several months before dog-teams or ox-carts. This does not mean that aircraft have got to be slow. If high speed makes them more economical to operate, so much the better.

"Eventually, of course, in anything of this sort the question of relative cost creeps in, and quite rightly. This applies equally to bush or outback operations as it does to the movement of heavy freight over long distances. The difficulty about estimating the cost of this type of aviation is that it is very difficult to find comparable figures. In Northern Canada the cost per ton-mile by air is not much greater than by road, but that takes no account of the cost of the road in the first place, or its maintenance. In Australia the railways, as in a great number of other countries, are run at a loss, yet quite obviously they must go on running.

"The difficulty at the moment seems to be to estimate correctly exactly what type of operations are most suited to each system of transport. The conclusions, as I see it, are that the scope for aviation will be considerably broadened: first, when the full advantages and possibilities of aircraft are thoroughly appreciated and trusted by potential operators, and second, if and when suitable aircraft make their appearance. . . .

Conclusions. In the final section of his paper the speaker said: "At the risk of becoming monotonous I would like to repeat that aviation has become a vital and integral part of the civilization of the countries of the Commonwealth and Empire, and that their further development depends upon operators demanding, and the aircraft industry producing, machines capable of doing a wide variety of work cheaply and efficiently.

"At the moment," he continued, "the centre and head of the aviation industry for the Commonwealth and Empire is in these islands. It is true that great strides have been made in some of the Dominions in the design and production of aircraft suited to their own needs, but the industry in these islands is still the leading partner and capable of making many useful contributions for a number of years yet. If it is to do this it must not be blinded by the chances of lucrative Ministry of Supply contracts, or have its attention to the requirements of the Commonwealth and Empire distracted by the clamour of Britain's airline operators. The Ministry of Supply, the Service Ministries and the civil operators are obviously the industry's best customers and patrons, and they cannot be blamed for only considering their own special requirements. But if the industry is to play its proper part it must look beyond that and consider the progress of aviation as a whole all over the world.

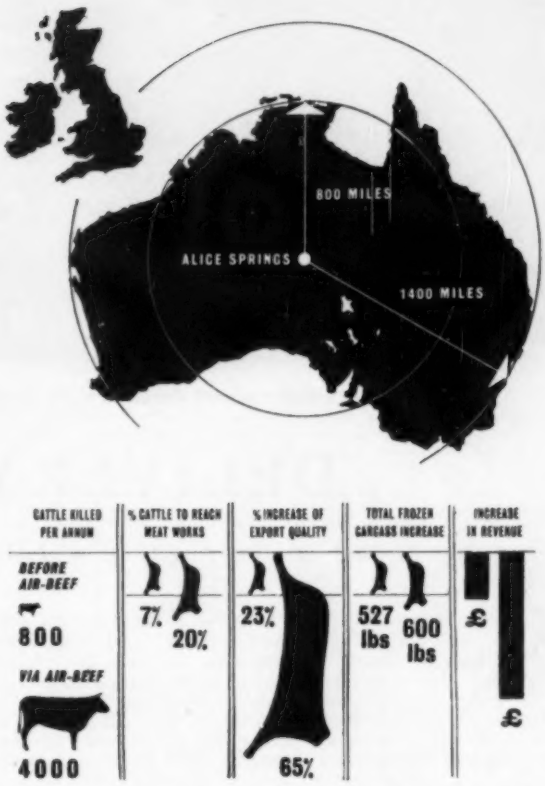


Fig. 6. The improvement in Australian cattle marketing brought about by the Air Beef scheme, under which beef is flown from cattle station to coastal port.

"I have no intention of telling them how this can be done. All I wish to do is to draw attention to what I think has become a neglected part of aviation. What is more, it is that part of aviation which has the most important part to play in opening up the remote areas of the new world.

"It rather looks as if I have placed all the burden of the future development of outback and bush aviation on the makers. That is not the impression I want to leave. It is much more important that each party concerned should understand and appreciate the demands, difficulties and limitations of the others and of aviation in remote areas in general.

"I started the preparation of this lecture thinking it was going to be quite a burden, but thanks to the wonderful help I have had from people all over the Commonwealth and Empire, I have learned more about aviation than I could have done in any other way. For that reason I owe a debt of gratitude to the Royal Aeronautical Society for asking me to give this lecture. I have also acquired an even greater admiration for the pilots and operators of aircraft in what I have described as my third division of aviation. All over the world they are doing their work without fuss or fanfare, without publicity or uniforms, and nearly all of it is done with makeshift equipment.

"We hear often enough about the need for a strong, modern and efficient Air Force, and I fully agree with that. We hear, not quite so often, about the need for a strong, modern and efficient Mercantile Air Service, and at the moment that seems to me to be even more important. But above all, we must have an aircraft industry capable of meeting our own needs as well as the special needs of those countries whose development and future well-being depend upon aviation."

The scene at Essendon Airport, Melbourne, as the first Australian Viscount taxied to a halt on arrival from England.

DELIVERY DE LUXE

Impressions on the Flight of a T.A.A. Viscount from England to Australia

ON October 13th, at 3.30 p.m., Trans-Australia Airlines' Series 720 Vickers Viscount VH-TVA *John Batman* landed at Essendon Airport, Melbourne, Australia, after a delivery flight of 12,080 statute miles.

This delivery flight marked the beginning of a new era in aviation for this continent, because not only did it bring to Australia its first turboprop airliner, but the Viscount was also the first large British airliner to be delivered to Australia *for twenty years*.

It was another step along the road for T.A.A., who had planned for three years to introduce this aircraft to Australia, this company being actually the fourth definite customer Vickers had for the Viscount (the first three were B.E.A., Aer Lingus and Air France), and its performance and reception more than justified the faith evinced in the aircraft by Mr. J. L. Watkins, T.A.A.'s director of engineering, when in 1951 he recommended the purchase of the model 720 by his management.

The T.A.A. specification for the Viscount 720 was such that this series differs greatly from the 700. In point of fact, flight and acceptance trials of the 720 became the proving ground for the majority of the new features Vickers are introducing into the new Series 700D.

The delivery flight was planned to leave London Airport on Wednesday, October 6th, with VH-TVA scheduled to rendezvous over Melbourne with a photographic aircraft at 2.55 p.m. on Wednesday, October 13th; and the flight operated to such a schedule that VH-TVA actually arrived over the rendezvous 11 minutes early.

The personnel concerned with the delivery flight were: Flight commander, Capt. F. Fischer; 1st officer, Capt. D. Winch; navigator, Capt. H. Locke; radio officer, R/Off. B. Roberts; and flight engineer, Eng/Off. S. Banks.

Seventeen passengers were carried, eleven being T.A.A. personnel: Mr. J. L. Watkins (director of engineering) and Mrs. Watkins; Mr. J. G. Dailey (planning and performance engineer); Mr. E. F. Coate (radio engineer); Messrs. Buncle, Phillingham, Berrie, Kirk, Taylor and Dunn; and Mr. G. Thompson (film producer and cameraman).

The remaining six were Mr. R. Simmonds of Rolls-Royce; Messrs. C. Spooner, R. Shaw, and J. Gunn of Vickers-Armstrongs Ltd.; Mr. J. Tupman of Normalair; and Mr. E. Birchill of Rotol.

From a mechanical aspect, the flight was a complete success. Every one of the 56 engine starts was faultless, and the only mechanical faults experienced were an incorrectly set flap adjustment prior to take-off and a faulty windscreen wiper *en route*. As the delivery flight was to be through the tropics, where many landings and take-offs would be made at high aircraft weights and high ambient temperatures, complete performance studies were made by Messrs. Watkins and Dailey during the journey; and the results exceeded the most sanguine expectations of Vickers and T.A.A.

Although the Series 720 aircraft is cleared to 60,000 lb all-up weight, the fully loaded weight of VH-TVA on its delivery flight, with full tanks, amounted to 58,800 lb. At this figure, mid-day take-offs at Athens, Bahrein, Delhi, Bangkok, Djakarta and Den Pasar under high temperatures were accomplished without using more than about half of the runway length available.

Performance records of the flight and observations made *en route* have been summarized, and Tables I and II give the complete picture of the results. It can be seen that the performance exceeded the best hopes of the Vickers planning staff.

Passenger reactions during the flight were such as to prove the suitability of the turboprop aircraft for Australian travel. Despite the lack of sleep during the overnight stops (much of the time was spent in sightseeing and souvenir purchasing), the

TABLE I: VISCOUNT 720 VH-TVA: LONDON-MELBOURNE PERFORMANCE DATA

(Operational Conditions: 58,800 lb a.u.w.; 13,600 r.p.m. for climb and cruise; climbing speed 150 kt I.A.S.; average rate of climb 550 ft/min under hot conditions; average rate of descent 1,500 ft/min.)

Date (Oct.)	Stage	Naut. miles	Stat. miles	Altitude (ft)	Time (hr, min) Air	Time (hr, min) Block	Fuel cons. (lb)	Block speed (kt)	Fuel cons. (lb/hr)
6	London—Rome	809	932	19,500	3.07	3.15	7,680	249	2,360
7	Rome—Athens	585	674	19,500	2.21	2.33	5,701	229	2,240
	Athens—Beirut	620	714	19,500	2.36	2.24	6,176	227	2,260
8	Beirut—Bahrein	927	1,068	17,500	3.53	4.07	9,055	227	2,200
	Bahrein—Karachi	898	1,034	17,700	3.50	4.01	9,499	224	2,360
9	Karachi—Delhi	580	668	17,000	2.45	2.56	6,500	198	2,220
	*Delhi—Calcutta	728	839	17,000	3.37	*3.43	8,620	*196	2,320
10	Calcutta—Bangkok	858	988	17,500	3.49	3.56	9,208	237	2,340
	Bangkok—Singapore	781	899	17,500	3.36	3.46	8,301	208	2,210
11	Singapore—Djakarta	482	555	17,500	2.18	2.27	5,275	197	2,150
	Djakarta—Den Pasar	552	636	17,500	2.41	2.45	6,143	201	2,230
	Den Pasar—Darwin	949	1,093	15,500	4.08	4.15	9,607	224	2,260
13	Darwin—Alice Springs	709	817	17,500	3.15	3.20	7,993	213	2,400
	†Alice Springs—Melbourne	1,010	1,163	17,500	4.34	†4.42	11,217	†240	†2,390
	TOTALS	10,488	12,080		43.50	45.50	110,975	213	§2,290

*Times include diversion to Agra, descent, and two photographic circuits of Taj Mahal at low level.
†Includes 38 min demonstration flight at 10,000ft and two aerodrome passes. Actual time from take-off to over Essendon Airport was 3 hr 55 min.
§Average equals 287 gal/hr.

On arrival at Essendon, the crew of the T.A.A. Viscount were welcomed by Australia's Minister for Civil Aviation, Mr. A. Townley. Shown above are (left to right) Capt. F. Fischer and Capt. D. Winch, his co-pilot; Mr. Townley; Capt. H. Locke (navigator); Eng/Off. S. C. Banks; Mr. J. L. Watkins, T.A.A.'s director of engineering; and Mr. G. P. N. Watt, chairman of the Australian National Airlines Commission. On the right, VH-TVA is shown making a demonstration run before touch-down at Essendon.

passengers remained wide-awake and active throughout the whole trip—so active that Capt. Fischer, when responding to the speeches of welcome at Essendon, referred to the constantly changing trim of the aircraft, caused by the exuberance of the cabin occupants.

T.A.A. are satisfied that the appearance, facilities and comfort of the 44-seat cabin will surpass anything now offered in Australia. The new Normalair pressurization and air-conditioning system proved highly satisfactory throughout all varying air- and ground-operating conditions, and its performance showed that it can be expected to provide maximum passenger comfort on T.A.A.'s domestic routes.

The company-planned radio installation worked perfectly throughout the flight. Long-range H.F. radio-telephony and V.H.F. were used throughout and not once was it necessary to revert to C.W. operation. V.H.F. communications were excellent, 5 × 5 reception conditions at 250 nautical miles being the normal experience on every leg and between Alice Springs and Melbourne; a trial call to Adelaide from 420 n.m. at 15,500ft gave a strength report of 3 × 3.

From the passengers' viewpoint, this ferry flight presented what has probably been the most comfortable air journey ever made from England to Australia. Every night was spent on the ground at an interesting city and every mid-day meal was served on the ground at an airport terminal.

Customs and other transit facilities were all handled most expeditiously, and flying concluded each day at an hour which generally allowed adequate time for sightseeing and shopping.

During the whole trip there were only two occasions, of about two minutes each, when turbulence was experienced—and one was man-made, when Capt. Fischer took the Viscount over the Equator with appropriate control movements. This was for the benefit of Messrs. Tupman and Birchill, whose first crossing was celebrated by their being crowned with pineapple rinds and presented with certificates.

A day's stay-over was made at Darwin so that the aircraft could be checked and cleaned. Here T.A.A.'s assistant general manager, Mr. J. P. Ryland, and the Director of Operations, Capt. J. Chapman, joined for the flight to Melbourne.

After the arrival of VH-TVA at Essendon, work immediately began on the installation of the Australian designed and manufactured buffet equipment, and this work was completed within three days. Flight training then proceeded and the programme was so satisfactory that the first paying-passenger turboprop flight in Australia was made on Thursday the 21st—within eight days of the delivery. Passenger reaction was such as to justify completely T.A.A.'s faith in the Viscount.

Mr. G. Thompson, the film expert, had stayed with the T.A.A. engineering party at Vickers' Hurn factory throughout the final manufacturing stages and flight acceptance trials, covering the various activities for a documentary film and newsreel; and during the ferry flight he photographed scenery and recorded the activities of all on board. It was expected that in due course T.A.A. would be able to make copies of this film available at their London office.

E. F. C.

TABLE II: CRUISE SUMMARY
(Comparison of actual ferry-flight performance with manufacturers' estimates)

Obs. No.	Flight perf.		Estimated perf.		Percentage gain	
	T.A.S. (kt)	n.m./ 100 lb	T.A.S. (kt)	n.m./ 100 lb	T.A.S.	n.m./ wt
1	256	10.65	252	10.61	+1	0
2	261	10.9	259	10.95	+1	0
3	256	10.7	252	10.55	+1.5	+ 1.5
4	244	10.15	237	9.95	+3	+2
5	244	9.85	243	9.70	0	+ 1.5
6	249	10.40	245	10.35	+1.5	0
7	248	10.30	237	9.80	+4.5	+5
*8	255	10.85	237	10.50	—	—
9	236	9.95	234	9.95	+1	0
10	248	9.80	237	9.60	+4.5	+1
				Average	+2	+1

* Observations doubtful near cumulus clouds. 260 kt = 300 m.p.h.

Editor's Postscript.—It will be remembered that VH-TVA was destroyed in a training accident near Melbourne less than three weeks after delivery. The second and third aircraft, however, are now in Australia, and T.A.A.'s Viscount services on the Melbourne - Sydney and Melbourne - Brisbane routes were due to be in operation by Christmas. The fourth Viscount was to have left Hurn for Melbourne last week-end, and delivery flights of the fifth and sixth machines are scheduled for January and February. The sixth of T.A.A.'s Viscounts, incidentally, will be the first to have Dart 506s and external slipper tanks, and the fifth has built-in provision for the extra tanks.

APPRENTICESHIP EXERCISES

THE Society of British Aircraft Constructors has produced a handbook of practical exercises which, it is felt, will be of considerable assistance to those responsible for apprenticeship training in the aircraft industry and also to authorities responsible for the teaching of engineering subjects.

The new handbook contains a syllabus suitable for probationary apprentice training, and exercises related to the syllabus have been chosen by the Society's Education and Training Panel so that a selection can be made to suit a variety of requirements.

After an introduction to the use of hand tools, examples range from elementary exercises in filing, drilling, sawing, tapping, reaming, etc., to details of simple fitting and machining operations leading to the assembly of typical tools and workshop equipment. The handbook is so arranged that further suitable examples can be added.

Copies of the handbook, price £4 15s each, can be obtained from the Society of British Aircraft Constructors, Ltd., Technical Section, Summit House, 1/2 Langham Place, London, W.1.

B.E.A. DRAMA GROUP

IN September last, British European Airways decided to form a drama group, and their first production was staged at the French Institute, South Kensington, on December 13th and 14th. They put on a three-act comedy by Peter Blackmore, called *The Blue Goose*, which was an excellent choice for a new company, albeit a company which showed few signs of inexperience. A distinguished audience, including the Mayors of Kensington (Lady Petrie) and Westminster, Mr. Peter Masefield (chief executive of B.E.A.) and M. Jourdan (director of the French Institute) and Mme Jourdan, watched a remarkably polished performance. Lord Douglas of Kirtleside, chairman of B.E.A., was prevented by illness from attending.

In a most competent cast, particularly noteworthy was the playing of Fay Ward, as an impulsive mother dedicated to the local amateur operatic society; Patricia Robertson-Kellie and Dolores Olsen as her daughters; Denis Carew as a dashing sailor; and Bob Fletcher, as the local mayor and also a henpecked fiancé. The production was by J. Mackay Whitton.

UP AND COMING...

The size and form of London Airport's big new buildings are well defined in these new views by Aerofilms. Above are the tower, passenger terminal and administrative block (of which little more than the steel frame is yet apparent). North of the virtually completed tower is the tunnel linking the central area with the Bath Road and the existing terminal area (top right), which will become known as L.A.P. North. The central area will initially handle only short-haul services. Below are two magnificent contrasts in modern engineering — the B.E.A. base and (right, with L.A.P. North in the distance) the new B.O.A.C. hangars.

HERE AND THERE

UP AND OVER: Passengers in 1957 taking the 9.30 rotorbus from Waterloo to Southampton, Bristol, Cardiff or other stops west may enjoy a view such as this as they move up the Thames past Westminster. This portentous picture was taken by the Editor from a WS-51. Within fifteen minutes of leaving "Flight's" London offices he was clear of the congested city and over the Weybridge area of the Surrey countryside.

Sabres for South Korea

SEVENTY-FIVE North American Sabres are to be handed over by the U.S. authorities to the South Korean Air Force. America, in addition, will undertake the training of 400 South Korean pilots and some 500 ground staff. Instruction will take place at Osan, south of Seoul.

Lebanese Sequel

THE sequel to the troubles of the Spitfire ferry pilots in Lebanon ("Middle East Mix-up," this page, last week) was that—according to Beirut Radio—"all three British pilots have signed confessions before the Lebanese investigators that they had flown over Lebanese territory because of the shortage of fuel in one of the planes." Each pilot, it was added, had been fined 100 Lebanese lira for landing in Lebanese territory without an official permit.

The F-100 Trouble

NOTWITHSTANDING an earlier statement that structure failure was responsible for the recent F-100 crashes (*Flight*, November 26th), it is now reported that the trouble is attributable to high-speed yaw encountered at speeds above Mach 1, subjecting the aircraft to side forces well beyond its design limit. The F-100 in which North American test pilot George Welch met his death was heavily instrumented, says *Aviation Week*, and more than half of the instruments were recovered intact. As investigations proceed F-100s remain grounded.

Wright 51st Anniversary Marked

ON Friday, December 17th, the 51st anniversary of the Wright Brothers' flight, a memorial to pioneer airmen was unveiled on Governors Island, New York, in the presence of some fifty men who had made solo flights before 1916. The unveiling was performed by a Bell helicopter which, flying about 40ft above the monument, lifted away the veiling material by means of a cable. On the same day, the 18th Wright Brothers Lecture was delivered in Washington by Bo Lundberg, director of the Swedish Research Institute; his subject was *The Fatigue of Airplane Structures.*

Big Survey

THE largest-scale air survey ever made in Australia for oil and mineral deposits is expected to begin early in 1955. Hunting Aerosurveys, Ltd., in association with their subsidiary Adastra Airways, plan to cover several thousand square miles of country.

A Career Envisaged

A PARTY of 22 schoolboys recently visited the Rolls-Royce aero-engine factory at Derby, where they toured the workshops and laboratories and saw gas turbines under test. The boys, from 16 to 18 years of age, were already interested in engineering and it was expected that their visit would finally confirm their choice of career.

Canada's NATO Aid

THE Canadian Department of Defence in Ottawa has just issued a report on the assistance provided by Canada under NATO mutual aid agreements since the programme opened in 1950. In addition to the shipment of over $500 million (£178 m) worth of arms, ships, aircraft, tanks, lorries, radar, etc., to NATO countries in Europe, Canada has spent vast sums on the aircrew training programme under NATO. To date over 1,200 pilots and nearly 2,000 navigators have been passed out, the cost to Canada being $224,500,000 (£81m). The Dominion's total NATO contribution in four years has been $1,100 million (£394,000,000).

Generous Offer

THE Senate of Queen's University, Belfast, has accepted an offer made by Short Brothers and Harland, Ltd., to assist in the setting up of a school of aeronautics. The Vice-Chancellor has announced that the company proposes to give £7,000 towards the capital cost of equipping the school and £4,000 a year towards its annual cost until such time as the University Grants Committee recommend that it be borne by the Parliamentary grant.

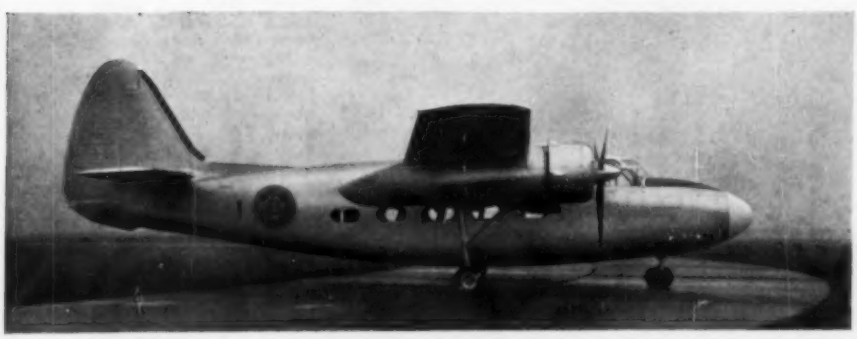
The Alcock and Brown Story

CURIOUSLY, no full-length book has yet appeared on the momentous transatlantic flight by Sir John Alcock and Sir Arthur Whitten Brown in 1919. This situation will be remedied in the near future by the appearance of *The Flight of Alcock and Brown*, by Graham Wallace, published by Putnam and Co., Ltd. In the course of his researches into the flight the author visited Newfoundland and Ireland.

"Amy Johnson" Scholarship

THE 1954 award of the Amy Johnson Flying Scholarship has been made, the Women's Engineering Society announce, to Miss Dorothy White of Runcorn, Cheshire. Miss White, who is 28, has been a member of the W.J.A.C. for many years, winning a flying scholarship in 1947, and was also a pilot in the W.R.A.F.V.R. for three years until it closed down earlier this year. The Amy Johnson award, which is worth £150, was offered to assist a woman holder of a Private Pilot's Licence to qualify for an Assistant Flying Instructor's Certificate. The selection committee includes representatives of the Royal Aero Club, the Association of British Aero Clubs, the Guild of Air Pilots and Air Navigators and the Women's Engineering Society.

SWEDISH PEMBROKE: As recorded last week, a substantial number of Hunting Percival Pembrokes are being supplied to the Swedish Government. The first of the batch, which left Luton on December 15th, is seen in the photograph below.



An air-to-air photograph of an Avro Shackleton M.R.2 taken by the squadron over Malta.

MALTA SQUADRON

A Visit to a Shackleton Unit Based on the George Cross Island

MALTA, G.C., is uniquely situated in the Mediterranean as a base for long-range maritime aircraft, and at Luqa the Royal Air Force maintains Nos. 37 and 38 Squadrons, both of which are equipped with Avro Shackletons. They come under direct orders from the Air Ministry and operate under Air H.Q. Malta, but carry on a close liaison with Coastal Command. Air Marshal B. V. Reynolds, C.B., C.B.E., who is A.O.C. Malta, is also Deputy C-in-C. (Air) Allied Forces Mediterranean, and under his command the two squadrons take part in NATO exercises.

A recent visit to Malta to watch the ceremonial parade of the departing Australian fighter squadrons provided an opportunity to see No. 37 Squadron at work. A combination of flying commitments and hydraulic unserviceability unfortunately prevented us from taking the air with this famous unit, but the commanding officer, S/L. R. S. Smith, A.F.C., was able to describe its day-to-day work.

As would be expected, the major part of the aircrews' work is reconnaissance and anti-submarine operations. For the latter they enjoy first-class co-operation with Mediterranean naval units, using small break-up bombs in their own attacks against submarines and employing the sonobuoy technique to home surface ships on to targets. Every time a submarine is on passage through the Mediterranean practice attempts are made to locate it at snorkel depth.

To give some bad-weather flying there is a detachment of one Shackleton every fortnight to Gibraltar, whence long-range navigational flights are made over the Atlantic.

Each year training builds up to participation in the NATO exercises such as "Medflex," but the "Defence of Malta" each September is the big job of the year.

In addition to operational requirements there is a search and rescue commitment which entails one Shackleton and crew being at immediate readiness 24 hours a day for 365 days of the year. With Malta as the centre, these S/P aircraft operate westward to Gibraltar, southward into north Africa and eastward to the Aegean Sea. The service is available to all ships, to all aircraft, R.A.F., naval and

(Above) The C.O. and flight commanders: F/L. P. J. McMonagle, D.F.M. ("A" Flight), S/L. R. S. Smith, A.F.C. (C.O.), F/L. D. R. Foster ("B" Flight). Aircrew in the group are: F/S. S. Archer, F/S. E. J. Baynes, Sgt. D. Ladd, F/S. D. P. Hutchinson, A.F.M., Sgt. D. Kemp, F/O. P. E. Turner, F/O. J. H. Rowland, F/O. K. G. F. Shelley, F/O. D. H. Moreland, S/L. R. S. Smith, A.F.C., F/O. P. R. Seldon, Sgt. D. R. Kenton, F/O. M. R. Doherty, F/O. E. Sims, F/O. W. D. Lincoln, Sgt. J. E. Stuckey, F/O. J. F. Schofield, Sgt. D. Gastrell, Sgt. P. G. Castens, Sgt. J. V. Harris, F/L. A. D. B. Beveridge, F/L. D. R. Foster.

Maintenance: (Left) Fitting a new de Havilland airscrew with the aid of a Coles mobile crane. (Right) The two airmen attending to the starboard inner power plant lend scale to the 2,450 h.p. Rolls-Royce Griffon 67 and its six-bladed contra-rotating airscrew.

civil, and to anyone travelling in the North African deserts.

The usual method applied is for the Shackleton, flying at 3,000 to 5,000ft, to fly a standard search pattern over the likely area, the legs being 10 to 20 miles apart. A green light is fired every five to ten minutes and, if they are able, the people on the ground or in the sea are expected to fire one red light in reply and a further red light as the aircraft passes overhead. The Comet searches kept the S/R service busy for a long while.

Each Shackleton carries a crew of ten: captain, co-pilot, two navigators, engineer and five signallers. Maximum take-off weight is 86,000 lb.

Life for the aircrews, and to some extent for the ground crews, is varied by a number of detachments. For instance, in the summer of 1953—before the unit was equipped with Shackletons—four Lancasters of the squadron went on detachment to the Trucial Oman. Here reconnaissances were made to detect movement on the Saudi-Arabian border, and water and supplies were dropped to Aden Protectorate Levies patrolling the area. The islands were also watched for Persian frigates.

A more recent detachment was that made in July last, when some of the Shackletons went to Durban to exercise under command of the South African Air Force in co-operation with the South African Navy, the French Navy and the Royal Navy. For this detachment there were supporting aircraft to carry ground crews and spares, but ordinarily for such trips ten ground crew or some equipment is carried in each aircraft. With twenty men on board a Shackleton is rather full, but the ground crew are made fairly comfortable.

On the occasion of the Queen's return last summer from her Commonwealth tour two Shackletons escorted Her Majesty from Aden to Entebbe. On the return flight one Shackleton, with long-range tanks, made the journey from Entebbe to Luqa in one hop; the other landed at El Adem to refuel.

No. 37 is a squadron with a quite remarkable history, which goes back to April 1916 when it was formed as an experimental unit at Orfordness. Its life, however, was extremely short, for it ceased to exist a month later on being absorbed by the experimental station. In September of the same year No. 37 was re-formed at Woodham Mortimer, Essex (under Major W. B. Hargrave), as a Home Defence squadron flying B.E. aircraft. On the night of June 16-17th, 1917, Lt. L. P. Watkins destroyed Zeppelin LZ-48 over Suffolk. In 1919 a move was made to Biggin Hill, where the unit was renumbered No. 39 Squadron.

Re-formation came again in April 1937 at Feltwell, from personnel of No. 214 Squadron. Initial equipment was Handley Page Harrows but by the outbreak of war in September 1939 the squadron was flying Vickers Wellingtons.

With these aircraft, and in company with the squadrons of Blenheims and Hampdens, they had to take the brunt of the daylight attacks on German naval targets, the crews operating under precise orders not to let a stray bomb hit German civilians.

A raid against the Schillig Roads and Wilhelmshaven on December 18th, 1939, was so disastrous that the rôle of the Wellingtons was changed to that of night bombing. On this occasion twenty-four Wellingtons, six from No. 37 and the remainder from Nos. 9 and 149 Squadrons, were pounced upon by Me 109s and 110s, which made beam attacks; to these tactics the Wellingtons had no reply owing to their limited fields of fire. In this operation No. 37 lost five of its six aircraft. A direct outcome of this air battle was the decision to fit armour plate and self-sealing tanks.

After further bombing operations in Europe, including an attack in September 1940 on Berlin by eleven Wellingtons, all of which returned safely, No. 37 moved to the Middle East. Here again they ran into further trouble when, with few aircraft and fewer reserves, Britain had the Malta, North African and Grecian campaigns on her hands simultaneously. The squadron was one of the four Wellington squadrons left in the Western Desert to cope with FliegerKorps X during the retreat to El Alamein in 1941, at the same time being required to send a detachment to Greece to serve under A.V-M. J. H. D'Albiac against the Luftflotte 4, which had well over 1,000 aircraft against less than 100. As soon as that ill-starred campaign was over, ten aircraft of the squadron were sent to Shaibah to operate against the rebel Iraqi forces attacking Habbaniya.

With the turn of the tide and the invasion of Europe from the south, No. 37 moved into Italy, where they were re-equipped with Liberators. Their last operation of the war was against Freilassing marshalling yards, north of Salzburg, where twelve aircraft dropped 43 tons of bombs. During the war the squadron won four D.S.O.s, 47 D.F.C.s and 40 D.F.M.s.

Disbandment came in March 1946, but a month later it was re-formed by re-numbering No. 214 Squadron. A year later it was disbanded yet again and was finally re-formed at Ein Shemer in Palestine on September 14th, 1947. It moved to Malta in April 1948.

J. Y.

"FLIGHT" photographs

Thundering down the runway at Luqa, an Avro Shackleton takes off for a 13-hour long-range reconnaissance over the Mediterranean.

AIRCRAFT NOISE

—on the Ground and in the Air: Current Problems and Remedies Reviewed

THE article printed below appeared in a recent issue of a news letter circulated internally at the National Physical Laboratory. Though many of the points which it makes will be familiar to *Flight* readers, it does form a useful summing up of present methods and problems. It also serves to show—particularly in the closing paragraph—how closely the N.P.L. has been concerned with the search for solutions to the problem. The author is Mr. W. Charles Copeland.

Noise [he writes]—most pithily described as sound unwanted by the recipient—is certainly descriptive of the sound of aircraft. With increasing numbers of aircraft, particularly of turbojet machines, and the approach of the helicopter age bringing the noise nearer the centre of our cities, the problem of noise becomes worse and will affect more of us as time goes on. It is the purpose of this article to try to give some picture of the problem, in order that the reader may be able to form an idea of what has been, and what is being, done.

All those concerned (e.g., aircraft and engine firms, airport authorities and the Government), are acutely aware of the problem, and large sums of money have been spent on investigations and on the provision of noise reduction means. It is largely on behalf of Ministry of Supply that the National Physical Laboratory has been intimately concerned in the work.

The subject can be classified under three broad headings: (1) noise from aero engines on the test bed, (2) from aircraft running up on the ground, and (3) from aircraft in flight.

Noise from test-beds is the field in which by far the largest reduction of noise is possible, for the noise source can be largely enclosed, whilst airflow and gas discharge are effected through some form of sound-absorbent-lined ducts. For the testing of piston and turboprop units, a typical test-bed is, in effect, a tunnel some 150ft long, 30ft wide and 25ft high. The centre portion comprises the engine cell, and about 45ft at each end of the tunnel is filled with vertical splitter-panels of sound-absorbing material, some 4in to 6in thick, extending from floor to roof. The large intake and exhaust area is necessary for reasonably correct airflow conditions past the propeller. In practice, these splitters are not straight but incorporate bends, so helping to increase the attenuation of the higher frequencies.

By these means, noise at middle and high frequencies is virtually completely suppressed, but greater attenuation of the low-frequency noise would be desirable. Unfortunately, all sound-absorbing materials become much less efficient at these low frequencies and increased attenuation is possible only by the use of resonant-type absorbers of one sort or another, or of greatly increased thickness of material (several feet thick, in fact). These measures have been applied partially, but to do so fully would result in test houses of extravagant size, not to mention cost, which already runs into tens of thousands of pounds for one test-bed alone.

The Difficult Turbojet

The turbojet engine presents greater difficulties because of the large mass of gas discharged at high temperature and velocity. A major part of the noise arises from the turbulence at the boundaries of the jet after it leaves the engine, and its intensity varies as about the 8th power of the jet velocity. Irrespective of the amount of sound-absorbing material used, if the final discharge into the atmosphere is made at jet tail-pipe velocity, then very little sound reduction will be achieved. The jet is therefore made to entrain a large mass of air to help in reducing gas velocity by cooling, and to avoid destroying the soundproofing. In one form of test house the air is mixed with the jet in a large chamber to allow expansion, thus achieving both low velocity and temperature before the mixture is discharged through absorbent splitters of the type used for piston engines. In another form, air is entrained by the jet at its entry into a large sound-absorbing circulator tunnel of increasing diameter.

A modern turbojet is one of the noisiest pieces of machinery we have—its total sound power output may well reach about 50 kW (1-2 Watts for a pneumatic drill!) It would be impossible to stand near one of these engines without wearing efficient ear defenders, and even then one's ears would "sing" for hours afterwards. Nevertheless modern methods of silencing make it easy to carry on conversation quite near to the exhaust end of the test-bed, where the aural sensation is that of a low-frequency rumble. Further reduction of this noise would be desirable, but is again a problem yet to be solved in a practical way, and is further complicated by the fact that the final discharge itself is still producing low-frequency noise.

Reduction of noise from aircraft on the ground is a much more difficult and complicated task to achieve. Obviously, a solution would be to put the aircraft in a very large test-house, but its size and cost would be very great. The number needed at, say, London Airport, would tax the space resources of even that large aerodrome if civil aircraft maintenance were to be carried out on schedule.

Substantial noise reduction without such elaborate means is possible for turbojet engines by discharging the jet into a muffler (in effect, an absorbent-lined tunnel) built out from one wall of a pen into which the aircraft is wheeled. By this means the loudness can be reduced to about one-tenth. The system at the moment is confined to single-engined machines, but in the reasonably near future, when a number of practical difficulties have been overcome, its use may be extended to multi-engined machines. In practice it is impossible to effect such substantial noise-reduction in propeller-driven machines, because the propeller contributes at least as much noise as the engine. They could be removed and the engine power absorbed by dynamometers, but this is hardly practical, and in any event would not permit of correct engine testing.

Noise reduction can also be achieved by screening pens or walls, and undoubtedly the use of these will increase. They can, in the main, be built to shield a sector only around the aircraft, but even so they would be of value on airfields where the maintenance area lies fairly close to residential property. Such systems have already been tested at London Airport.

Directional Noise

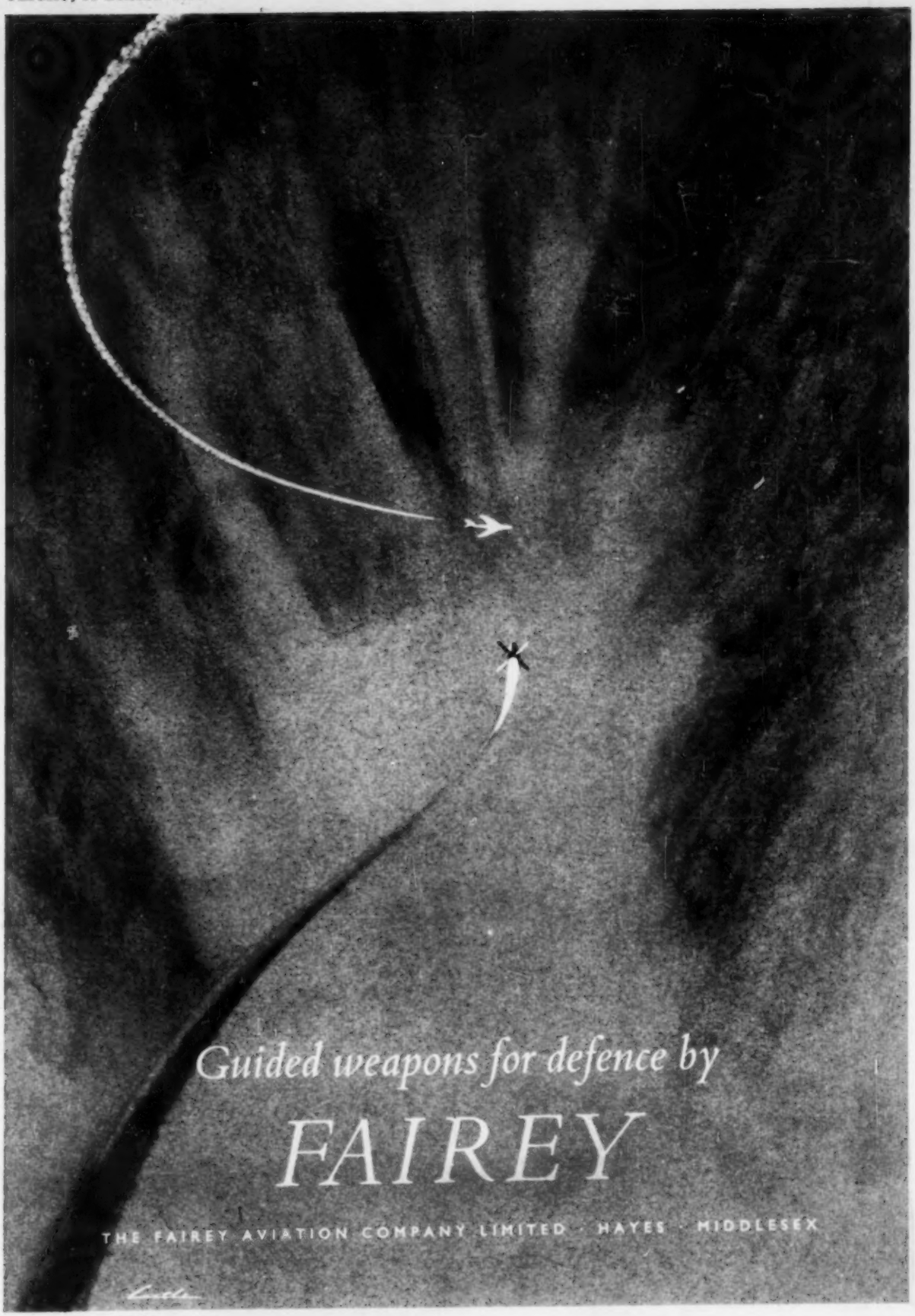
As the noise around an aircraft, and particularly turbojet aircraft, is markedly directional, it is possible to reduce noise by suitable orientation of the aircraft such that the direction of maximum noise propagation lies across the least densely populated area. Much use is made of this expedient, but it cannot be relied on with turbojet machines, which may have to face into the wind.

The problem of noise from helicopter air terminals in centres of our cities has yet to become serious. As much work as possible is being done, however, and much thought is being given to the problem involved, in order that when these terminals are built the noise may be kept to a minimum and cause annoyance to the least number of people.

By now the reader should have gathered that there is no possibility of marked reduction of noise from aircraft in flight, particularly of propeller-driven machines, where the propeller tip-speed on the average machine is as low as can be tolerated, and consequently its noise level is the lowest possible. Some machines, of course, are not as quiet as they could be, but this does not greatly affect the issue. Some reduction of noise from turbojet engines can be achieved by fitting a toothed or castellated ring around the tail of the jet-pipe, but the noise is still very high. The extensive use of these devices and possible improved versions on the bigger and better turbojet engines of the near future may result in these being no more noisy than those we know today. Nevertheless something can be done by so arranging flight-paths that annoyance is caused to the minimum number of people for the shortest time. To this end, measurements of the noise from aircraft in flight have been made, and will continue to be made, to determine variation of noise level with height and angle from the machine.

Laboratory measurements made on absorbing materials have greatly assisted in the progress made, but the greater part of the work has necessarily been done on the site at aerodromes and factories, and in this our mobile laboratory has proved of inestimable value. It carries, apart from necessary acoustical apparatus, a comprehensive stock of such accessories as gum-boots, oilskins, sou'-westers, flying helmets, boiler suits, etc., and full use is indeed made of them. We are now quite inured to the hazards of exploring silencing splitters with a microphone in an air draught of anything up to perhaps 30-40 m.p.h. (a very cool process in the early hours of the morning), entering quite clean and emerging covered with oil and soot, and half stifled with paraffin fumes.

[*References to aeronautical acoustics which have appeared in "Flight" have included: Detuner silencing (issue of September 5th, 1952); Cementation (Muffelite) system on Olympus test-beds (December 12th, 1952); "Aeronautical Acoustics"—report of symposium held by the Royal Aeronautical Society and Acoustical group of the Physical Society (June 12th, 1953); "Aircraft Noise Suppression" (July 9th, 1954); "Silencing the Swift"—description of Vickers-Armstrongs Detuner installation at South Marston (October 8th, 1954).—Ed.*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SMOKY AND THE BEAVER

THIS carefree story of a D.H.C. Beaver and its adventures in the Canadian Northland, planned on the spot, reaches us through the manufacturers of the aircraft. To preserve its pioneering flavour, we present it here just as received.

POGO'S neighbour, Miz Beaver of the Louisiana swamps, is rather a stolid homebody—in fact, you might say a solid domesticated type of beaver not inclined to adventure. But not so Associated Airways' Beaver GIX. GIX is a solid type, rugged and dependable but quite inclined to adventure and roaming. In fact, you can say she is a commercial type whose home is the vast territories of northern Alberta and the sub-Arctic.

GIX is no novice in the north; she has racked up over 4,500 hours' commercial work, most of it north of the 60th parallel. On December 21st, 1950, she made her debut with Matt Berry of Territories Air Services down at Fort Smith, in the Territories. Since the Federal Government is the big employer at Smith, Matt put GIX to work for the Department of Resources and Development.

As a government girl, GIX had a great variety of work, which is more than most government girls can say. GIX was out on fire patrol over Buffalo National Park, hauled reindeer-meat rations for the Eskimos, did inspection tours into the Arctic and generally kept the Department "on top" of its jurisdiction. Like all aircraft in the north, GIX did her share of emergency medical trips, bringing sick and injured Indians and Eskimos from the wilderness and tundra to government hospitals in Smith and Yellowknife.

In July 1951, GIX's boss, Matt Berry, left the north, so she got a job with Tommy Fox of Associated Airways, Ltd. (Edmonton and points north), who was taking over Matt's old stand at Smith and Yellowknife. After a bit of primping and fussing down at Edmonton, Fox put her back to work for Resources and Development at Smith.

In the fall of 1952, GIX tired of old faces around Smith and moved—north, of course! Things were booming in the mining industry and GIX figured she would find out if the hard-rock boys around Yellowknife and Hay River were all that she had heard.

It was during her stay at Yellowknife that GIX really justified everything her parents (de Havilland Aircraft of Canada) had said about her when they sent her out into the work-a-day world. One winter's afternoon in 1952, just eight days before Christmas, when the days are especially short up around Great Slave Lake, GIX was on an ordinary trip between Yellowknife and Hay River when her finest moment struck.

D. "Smoky" Gray was with her that afternoon, when off Sulphur Point, he noticed three figures on the ice. This in itself was not particularly noteworthy. But the catch was that the ice was not attached to the shore and the figures were signalling wildly to GIX. The fishermen had been out some distance from shore when the wind came up, and, before anyone noticed, the ice had broken away from the shoreline and the three men were adrift on Great Slave Lake with dusk coming on and the wind rising.

On circling around, Smoky saw that the ice-floe was breaking up at the edges, but that there still remained sufficient area to make a hazardous landing—if the ice was thick enough to hold hefty GIX's two-plus tons. Radio contact was made with Edmonton, and GIX gallantly offered to try a landing. There was a bit of soul-wracking as Associated's head offices weighed the chances, perhaps from a little more objective standpoint than that which GIX and Smoky held on that late afternoon in the growing dusk over the Great Slave Lake.

The task was one not covered in Dot's manual, even Lloyd's did not take that kind of risk, and GIX and Smoky might very well be going to their end. On the other hand, time and daylight were running out, and the three fishermen would surely not survive the night, as their island of safety was fast being chipped away by the waves.

The O.K. crackled out to poised GIX and Smoky, and Smoky replied, "Roger, I'm now going in, will call you back in ten minutes."

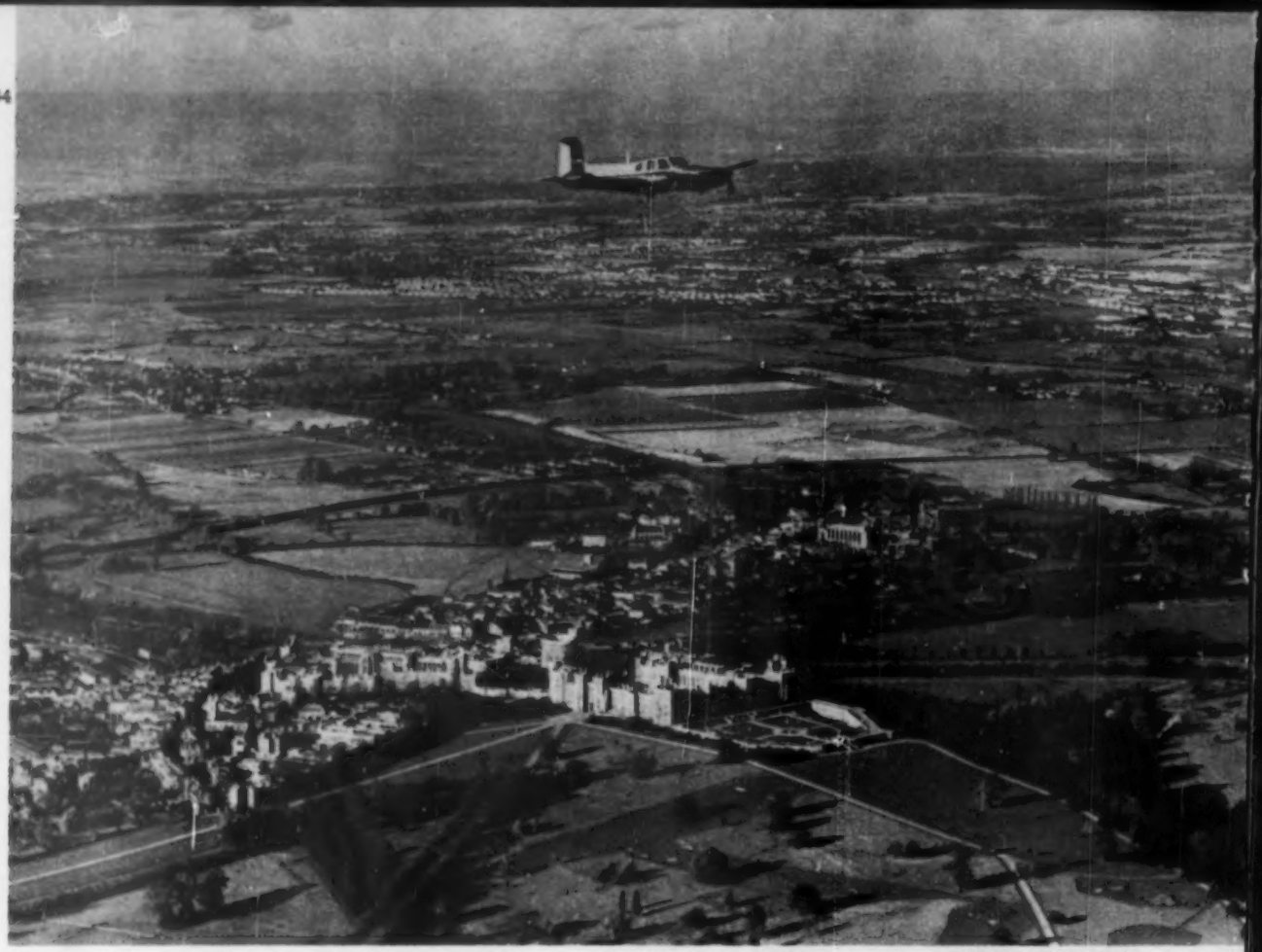
What a ten minutes! It was Smoky's and GIX's finest fraction of time, and a soul-searing, doubt-filled six hundred seconds for the boys on the receiver in Edmonton. Finally, after an eternity, through the static came the call "Made it, everybody fine."

Then the story was filled in. GIX nosed down gingerly; she had only 400 yards of ice for a runway, and her ski gear had no way to brake. The fishermen had signalled there was the minimum five inches of ice, but then you couldn't blame them if they had stretched it a bit. When GIX touched down she kept moving, as this minimized the chances of the ice breaking up, and the fishermen caught her practically on the run. But they made it, a wonderful feat of airmanship for Smoky, and a wonderful performance for GIX.

What has happened to GIX since that wintry afternoon in 1952 may be an anti-climax, but, like the steady trouper she has been since she went "commercial," she carries out her daily round without fanfare. During the spring and summer of 1953 she went back with her first love, the government, and participated in an historic occasion, when she carried Mr. G. Palsen, veteran surveyor for the Department of Mines and Technical Surveys, on his last job before retirement, that of running the line on the Alberta-British Columbia - N.W.T. border.

It was perhaps fitting that Mr. Palsen, an old-timer in the north, and GIX, a veteran campaigner in the same country, should be mated in Mr. Palsen's last job of keeping the boundaries straight and the expanding provinces out of the Territories, their old stamping grounds.

This summer, GIX is again striking out in new endeavours, supporting the operation of a helicopter in the "Headless" Nahanni River Area. GIX likes this operation; knows what it means for her passengers to have to walk ten or fifteen miles from the nearest lake to a likely outcropping or an incipient forest fire, bulling their gear through the bush. Now she won't have to sit around while her party is away; she can be busy, freighting in supplies, doing the long-haul work, while her running mate the whirlybird hops from shoreline to outcropping. So while GIX now has a team-mate, she continues to do a worthwhile job, speeding the development of the wealth of the north for the millions of Canadians down south.



"FLIGHT" photographs

TWIN-BONANZA in the Air

No. 52 of the Series

By THE EDITOR

OBVIOUSLY there is considerable overlap between the so-called private owner and executive classes of aircraft. In this country, however, a gap has opened—quite a chasm, in fact—between the two twin-engined types exemplified by the Gemini and the Dove. These two may be regarded as the most recent examples of private-owner twin and the smallest airliner-cum-executive machine. The chasm is thinly and antiquely bridged by a few Rapides and a Q Six.

In America, on the other hand, a new class of twin-engined machine is becoming increasingly popular and the aircraft concerned are finding favour in many foreign countries as well. The designs are the counterpart of the large American saloon car, and they carry from four to seven people in comfort and with all modern equipment for the work they may be required to do.

Europe has seen several examples of American executive twins, including the Model B50 Twin-Bonanza, the subject of this description, the Aero Commander, and the Piper Apache. Each of these types, relatively small as it is, has crossed the North Atlantic on delivery flight during the last few months, thus giving an indication of its performance capabilities and the extent of equipment which can be carried.

Recently *Flight* pilots were able to seize an opportunity to fly both the Twin-Bonanza and, as recorded last week, the Commander. The Bonanza was on its way to Aden, where it is to

(Above) From the bustling new world of its origin the Beech Twin Bonanza flies into the quiet English scene—a scene lit here by a late autumn sun which falls on the castle walls of Windsor and sets aglow the playing fields of Eton.

(Right) The B50 at Croydon. Note the pleasing nacelle shape, good forward view and the unusual tail colour scheme.

become the new executive aircraft of A. Besse and Company. The pilot was Capt. Nils Hulten, late of Saab of Sweden. We found the machine temporarily in the care of Mr. Griffith of Air Couriers at Croydon, receiving the kind of thorough in-transit check-over for which this concern is now well known among flying people.

Many of the points of interest in the Twin-Bonanza can be studied in the accompanying illustrations, but a few comments, first about the interior, will be helpful. As we have already indicated, the cabin is laid out rather like the inside of a large car. Front and a rear bench-type seats, fully upholstered, each give plenty of room for three grown-ups to sit abreast. Again, following coupé automobile practice, the starboard-side front passenger-seat onto which the single door opens, hinges forward to give access to the rear seats. The left and middle front seats, separate, are adjustable as a pair for leg length. The pilot(s) can sit in the centre or on the left, two pairs of adjustable rudder pedals and a swing-over wheel being provided.

The arrangement of controls and instruments and the furnishing and trimmings are all attractive and convenient, and the luxuries as well as the necessities are provided. For example, the cabin air-conditioning system draws outside air through a scoop in the nose and, according to need passes it through either a fuel-burning heater or an evaporative cooler. On the ground a fan circulates the air, but as soon as the wheels are retracted the fan cuts out and ram air is sufficient. The air temperature is automatically regulated by a thermostatic control. A separate system can be used for cool-air ventilation at any time.

Instrument lighting is of red or ultra-violet type according to choice and is rheostat-controlled. Interior and reading lights for the rear seats also operate automatically when the cabin door is opened.

Sound-proofing is quite effective, and to some extent the wings deflect the noise of the special extractor exhausts, which vent under them. Conversation in normal tones is possible at cruising power with the person in the next seat. As on most other aircraft of all sizes, there is still room for improvement in cabin noise level.

Plenty of luggage space is provided in separate compartments in the nose and behind the rear cabin-bulkhead. Coat-hangers are supplied in the rear locker and if an extra 50-gallon long-range fuel tank is demanded it can be fitted transversely immediately behind the cabin.

We shall not concern ourselves here with many details of the airscrews and carburettors except in so far as their controls affect the pilot and cockpit. The airscrews are Beech constant-speed feathering units, operated hydraulically. For feathering, the levers (mounted beside the throttles) are pulled full aft and the blade movement to 84 deg pitch takes only four seconds. The last few degrees of blade movement (from a windmilling 200 r.p.m.) are actuated by an electric feathering motor. This also serves to unfeather.

Another pair of levers, on the six-lever quadrant, controls mixture strength and operates the idle cut-off. Normally the levers would be at full rich and an automatic mixture-control then looks after altitude compensation.

The fuel taps and gauges are positioned by the first pilot's left hand. They are mounted on a diagrammatic panel which traces the flow from tank (and gauge) to carburettor. The majority of the switches are of the electric organ, flick-up-or-down tab type. The trim tabs for all three surfaces are sensed in mounting and direction and are found below the lever quadrant.

On an external check of the aircraft a number of details attract one's attention. There are the combination taxi light and cabin-air-intake grille in the nose, and the electrically operated retractable steps by which passengers reach the walkway on the wing—quite a luxury on a small aircraft. Then the excellent construction of the engine cowlings is noteworthy; they are very strong and stiff but still light, and they have sensible throw-clear hinges for the side panels.

Captain Nils Hulten, pilot to the owners of the Twin Bonanza, with (left) Mr. F. W. Griffith, Air Couriers, Ltd., and the author—all at Croydon. The aircraft stands high and the nose leg looks stilty.

The exhaust system, revealed when the panels are opened, is also one to gladden the heart of the maintenance man. Each of the "flat six" cylinders has a separate curved pipe and these, three on each side, converge and feed into an augmenter pipe, Convairliner fashion but on a small scale. The separate pipes allow for heat differences, expansion and so on without the sad results often experienced with a manifold. Whether the augmenters produce measurable thrust we do not know, but they do give a degree of automatic engine-cooling control. The nacelles are divided by baffles roughly on the horizontal centre-lines of the engines. Cooling air comes in through intakes around the spinner and must pass round the baffled cylinders to reach the lower area before escaping through the augmenter tubes. As the extraction effect of the exhausts directed into the augmenters increases with engine power and speed, so the cooling flow is made to increase. Sounding rather complicated, this system is nevertheless simple enough, as the illustration overleaf shows.

The doors to the luggage compartments are convenient in size and position. In the nose 100 lb can be accommodated, together with racked radio and, under the floor, the cabin heater. The rear locker is much larger and holds 200 lb. The doors have stay-open spring catches and thus need no holding or propping.

The particular aircraft examined had the full extra equipment of radio, autopilot and so on, the name of Lear figured largely. Walking round the aircraft it was necessary to look out for aerials, fan-marker stings and other projections. The extras were all fitted in a very businesslike manner with no suggestion of afterthought or lash-up. The trailing aerial has an automatic electric winder which operates if the wheels are lowered as for landing and the wind-in switch has been forgotten.

A Spell at the Controls

Talk and examination completed, I clambered in with Captain Hulten for a short flight. The engines started readily, and soon warmed up at about 1,200 r.p.m. (That they started was also an indication that the front cargo door was locked, this being the subject of a safety circuit.) Brakes were smooth and powerful and, with the aid of nosewheel steering connected with the rudder pedals, control on the ground was excellent. Turns can be made tighter with the differential use of engine and brakes, but this is not normally necessary and adds to tyre and brake wear.

Pre-flight checks call for no special comment; the use of colour-band coding for systems, controls including trimmers, and on

"Flight" photographs

The instruments and controls are plain, attractive and conveniently laid out, and the three-abreast seats give adequate room. The diagrammatic fuel panel can be seen near the control wheel, which itself is of the swing-over type for use from the port side or centre seat. The autopilot controls are at the base of the column, between the trimmers and the engine and airscrew levers. Much of the right-hand side of the panel is occupied by radio equipment. Flush switches are seen below it.

TWIN-BONANZA in the Air . . .

instruments is good. The green bands are a practical confirmation of normal flight conditions and positions. With the exception of the hydraulic brakes, all the services are electric.

For take-off from Croydon we moved onto the tarmac in front of the tower, and on receipt of the O.K. lined up on 240 near to the boundary fence. The standard tanks were nearly full but otherwise the load comprised two pilots and one passenger. For a short take-off 30 deg of flap is used.

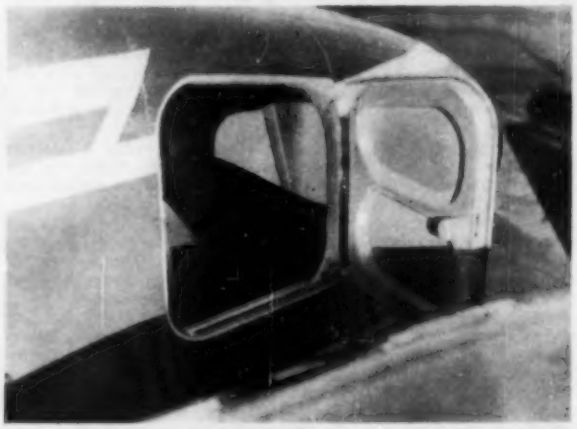
The engines were opened up against the brakes and on release the machine surged forward with more than average acceleration. The nosewheel came off in about 100 yards at around 60 m.p.h. and just as we left the end of the tarmac the aircraft lifted at a speed of 70 m.p.h. We held a steep angle of climb without difficulty, the speed quickly building up to the safe single-engine limit of 90 m.p.h.

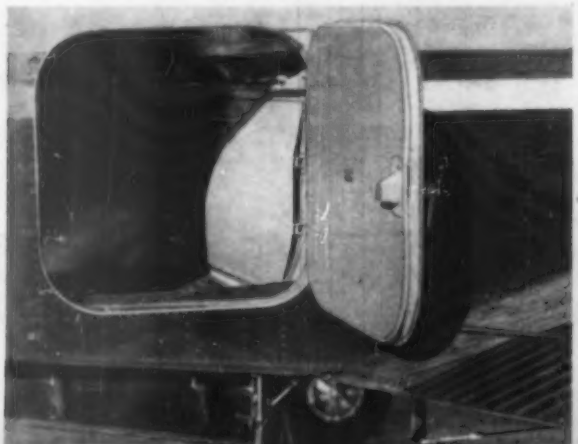
Our plan was to climb up from Croydon, briefly handle the aircraft, and then land at Fairoaks to collect *Flight*'s Gemini for a photographic sortie. We also spent a few minutes on autopilot in order to watch its operation and control—which was smooth and very positive.

At 5,000ft, with engines at 2,750 r.p.m. and 23in Hg boost, the indicated airspeed was 170 m.p.h. The ride was smooth and pleasant, and there was a feeling of spacious comfort about the cabin. The heater proved more than adequate. On this sort of aircraft there is little point in trying to make a technical assessment of control effect and stability. It suffices to remark that I found the elevators and ailerons light and responsive; in fact, just as I would want them to be. The rudder is a little heavier than the other two but is seldom required. Even so, when subsequently we checked the feathering on each engine in turn, I had no difficulty in holding the asymmetry on the rudder. The trimmers were all three effective, but the elevator tab seemed to have a small non-operative neutral zone.

When flying on one engine the machine held height easily on cruising power. The best single-engine speed was about 100 m.p.h. Maximum sea-level climb on one engine at 6,000 lb a.u.w. has been measured at 300ft/min. The feel of the controls with one engine dead and trimmed out was not appreciably different from that when flying normally at the same speed. The aircraft's apparent sweetness down to minimum safe speed on one engine might in itself constitute a trap; there is a definite limit to what should be expected under these conditions, and few people take advantage of any aeroplane, however docile, a second time.

Stalls presented no problem at all, either with or without





Features of the Twin Bonanza are: (Above) The retractable steps and large entrance door over the wing). (Right) The roomy nose luggage-compartment (with air-conditioning system under the floor and rocked radio just visible on the left). (Below left) The rear luggage-compartment. Coat-hangers are provided in the top, and in this case a 50-gallon long-range tank is fitted transversely in the front. (Below, right) The sturdy cowling, here shown partly open to reveal the flat-six engine and its exhaust system, including extractor-cum-augmenter.

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TWIN-BONANZA in the Air . . .

When airborne, the six-seater Twin-Bonanza, here seen over the Ascot area, looks smaller and neater than might be supposed from examination of the aircraft on the ground.

"Flight" photograph

power, or clean, or with everything down. The stall-warning hooter sounded in plenty of time, then the aircraft fell gently and evenly out of (elevator) control. There did not seem to be any effort to drop one wing rather than the other, and I was able to make the recovery rapidly with little loss of height. The approximate speeds associated with the two power-off conditions, clean and with flaps and wheels down, were 70 m.p.h. and 60 m.p.h. respectively. Engine thrust put considerable extra air where it was wanted and lowered the stalling speed by as much as 10 m.p.h. There was no call to make continuous use of trimmers during a flight, and the trim-change, nose down, as wheels and flaps were lowered, was only slight.

Among the limitations set by the makers and licensing authorities are spinning—though recovery is reported to be normal—aerobatics and dive speeds in excess of 227 m.p.h. This maximum speed limit could probably be exceeded quite easily in a dive. Aerobatics would very likely be well within the Twin-Bonanza's capabilities and it is accurate to say that the airframe is particularly strong. The structure has been tested to 8g.

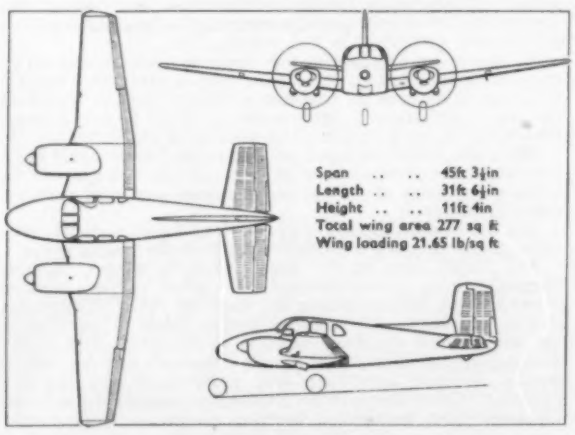
When approaching to land there is no need to observe a rigid drill and, if traffic conditions permit, the machine can be put down like a light aircraft. The start of our approach, according to recommendations, was made at 90 m.p.h. and the finish at 75 to 80. For short landings, power on, 65 to 70 would be safe for average weights "over the hedge". The best touch-down technique seems to be of the modern tricycle type, namely, to fly on gently with the nose slightly high. A round-out and prolonged hold-off of the classical type were not called for.

The view on the approach was very good and brakes could be applied as soon as all the wheels were down. The aircraft rode over rough grass and runways solidly but well.

The impression which remained with me on returning to Croydon after the Twin-Bonanza flight was that this aircraft retains enough of the simplicity of handling of smaller, older machines for it to be a one-man vehicle. It has the convenience, space and comfort necessary to make it acceptable to the executive, his family and colleagues when they wish to make a journey, and, in addition, it has all the performance and equipment "mod-cons" to enable it to tackle international flights by day and night and in almost any weather conditions. Without this approximation to airline standards an aircraft is liable to be left in the hangar too often and treated as a holiday or time-to-spare hack.

There remain two matters to settle: the bill and the pilot. Potential purchasers and Beechcraft sales staff can make more constructive suggestions than ourselves regarding the wherewithal—some £30,000 fully equipped—necessary for purchase. Incidentally, 99 of the Model B50s have been sold.

Month-to-month running costs are likely to be reasonable for the work capacity of the aircraft. So far as the pilot is concerned, the extent and kind of use to which the aircraft is likely to be put is the controlling factor. Any ordinary private pilot would be able to handle the machine safely on local flights and in good-weather conditions. But to take full advantage of its capabilities a well-qualified amateur or professional pilot would be an essential.



Latest Price List

Standard C50* f.a.f. Wichita $69,950. (Includes feathering airscrews, V.H.F. transmitter/receiver, L.F. range receiver, N.F. equipment and landing lights, cabin heater and ventilation system, full instrumentation.)

Extras: Dual control wheel $90; rotating navigation light $180; airscrew liquid anti-icing $750; engine pre-heat system $365; nose taxi-light $50; full air-conditioning $140; sun visors $22.50. The Lear auto-pilot is also a standard extra.

Two alternative extra radio installations are offered, each weighing approximately 100 lb. Installation A comprises two 5-channel V.H.F. transmitters (making a total of 3 transmitters and 15 channels); V.H.F. receiver making a total of two; omni receiver; marker beacon receiver; and A.D.F.; price $6,950. Installation B, also in addition to standard radio, 36-channel V.H.F. transmitter/receiver; omni receiver; marker beacon receiver; and A.D.F.; price $7,800.

**The C50 is the latest Twin-Bonanza model to be announced. This has 275-h.p. Lycoming engines giving improved performance.*

BEECHCRAFT B50 TWIN-BONANZA
Two 260-h.p. Lycoming GO-435-C2 Flat-six Engines

WEIGHTS	*lb*
Maximum a.u.w.	6,000
Empty (equipped) weight	3,948
Fuel (134 gall)	804
Oil (6 gall)	45
Six passengers	1,020
Baggage	191

CABIN DIMENSIONS	*in*
Length	119
Width	54
Height	51

PERFORMANCE (6,000 lb a.u.w.)	
Take-off distance, 20 deg flap, ground run	906ft
Take-off distance, 20 deg flap, to clear 50ft	1,260ft
Cruising speed, 65 per cent power, 5,000ft	181 m.p.h.
Cruising speed, 65 per cent power, 10,000ft	192 m.p.h.
Max. speed at 2,500ft	205 m.p.h.
Sea level rate of climb	1,450 ft/min
Service ceiling	20,000ft
Single-engine rate of climb (feathered)	300 ft/min
Service ceiling	7,000ft
Stalling speed, flaps down	69 m.p.h.
Cruising range (no reserves. 65 per cent power at 5,000ft)	919 miles
Endurance, 50 per cent power, 10,000ft	7 hours

LONDONDERRY HOUSE

A Note on the Historic Building Administered by the R.Ae.C. as the Aviation Centre

MOST people in aviation who have had cause to call upon the Royal Aero Club know the Aviation Centre at Londonderry House, 19 Park Lane, just round the corner from the Club's Piccadilly premises. Not so many visitors, however, know the history of this notable building.

The Club has been in possession of Londonderry House since 1946, when it was made available for 21 years at a "peppercorn rent" by the Marquess of Londonderry. The cost of re-instating the premises, which had been considerably damaged by enemy action, was met by generous subscriptions from members of the aircraft industry and others.

The imposing building still retains much of its earlier air of dignity and history, and in the paintings and sculpture there is a reminder of the spacious days of a hundred years ago, when the house was a social centre of this country's political life.

Only a few of these great London houses remain, and most of those which still exist are given over almost entirely to use as offices and flats. As Londonderry House is still available for social gatherings, the Royal Aero Club maintains its many fine rooms in a style that is in keeping with such occasions.

The House was built in 1775, and initially was not intended as anything more than a moderate-sized town house. It belonged to the last Earl of Holdernesse and was in fact first known as Holdernesse House. Nearly 50 years later, in 1822, it was acquired by the third Marquess of Londonderry, then British Ambassador in Vienna, and he had it considerably enlarged. The famous Wyatt brothers, Benjamin and Philip, sons of James Wyatt, the celebrated Georgian architect, prepared the plans, and in 1825 the House was almost entirely rebuilt. Some of the old structure was retained, but the new building was about twice the size of the old one, and the additions included the banqueting hall, the entrance hall in Park Lane (the entrance was originally in Hertford Street), the grand Greco-Italian double staircase, and the lofty ballroom on the first floor. In 1872 the building was renamed Londonderry House. By then its reputation was established, and its famous social gatherings included kings, queens, statesmen and soldiers from all over Europe.

Today, when hosts receive guests at the top of the staircase, one can easily imagine the scene, in the years forever gone, when the Duke of Wellington and his red-and-blue-clad officers, the statesmen, the great ladies with flashing jewels, and the powdered flunkeys all contributed to the brilliant dazzle of colour. Some hint of this splendour remains to this day. Portraits by such masters as Sargent, de László and Lawrence, look down on the ornate furniture and on the wooden mosaic floors on which today's gatherings are held.

These views show the graceful proportions of some of the rooms of Londonderry House. At the top is the conference room. The dining-room, also seen here, has service facilities for up to 100 people. When the ballroom—not shown—is used for dinners it can accommodate 135 or, for receptions, 400. At left is the impressive staircase.

Adjoining the ballroom is the newly opened drawing room, overlooking Park Lane and with the trees of Hyde Park beyond. It is used in effect as an extension of the ballroom, or separately for small functions, and the conservatory at the far end is sometimes a setting for a small business meeting or conference.

The main conference room, on the ground floor flanking Hertford Street, accommodates up to 35 people and is frequently the scene of meetings of various organizations connected with the aircraft industry.

The old banqueting hall is now used as a restaurant and provides plenty of space for either a buffet or for dining tables.

The library, also on the ground floor, is another room of congenial form; it is dominated by a great Stubbs canvas of *Hambletonian*, an outstanding race-horse of 1800. At the other end of the room's 60ft length is another Adam fireplace, while the shelves hold the many volumes of the Royal Aero Club's aeronautical collection. This room is frequently used for cocktail parties, wedding receptions, film programmes and company meetings. Other rooms in the building are used as offices by the Club and other aeronautical bodies.

Booster Ramjets for Helicopters

Some Operational Considerations Discussed

By P. R. PAYNE

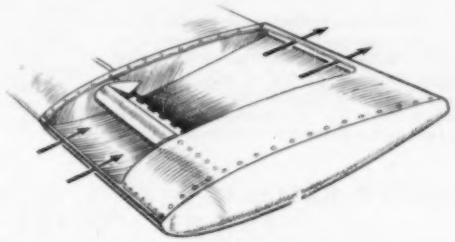
IN two previous articles[1, 2] a case was presented for the use of ramjets as a primary power unit. The purpose of the present article is to examine the application of the ramjet principle to boosting conventional helicopters, and to providing high power output for short periods of hovering with compound helicopters.

The basic difference between a primary and a secondary unit is that the former is operating the whole time the aircraft is flying, whilst the boost engine is normally inoperative. This means that boost ramjets must be designed with much more attention to cold drag, which implies some means of blanking off the internal flow. This is most easily done by some form of internal shutter, but a more efficient method is to pull the tail skins together so that the base drag is also minimized. The Marquardt boost unit has a "letter-box" type of intake which is blanked off by a retractable shutter when not in use. It replaces the outer 15in of the rotor-blade tip, and was probably designed with the Sikorsky S-55 in mind, since it has a chord of 16.5in and a depth of 2.5in. It weighs 5 lb more than the tip section of the blade which it replaces, and when inoperative increases the drag by about 3 lb. Producing a thrust of 40 lb at 650ft/sec tip speed it enables the payload of an S-55 type of helicopter to be doubled. As the unit operates during take-off and transition to cruise, the fuel consumption is relatively unimportant.

Since a ramjet will burn the same fuel as the primary power-unit, the increase in weight caused by its installation is small. The Marquardt system installed in the S-55 might increase the weight by 25 lb and, since the boost power would be 142 b.h.p., the corresponding power/weight ratio would be 5.7 b.h.p./lb dry weight. This can be compared with the cold-jet rocket-boost system (XLR32-RM-2) developed by Reaction Motors, Inc., for the S-55, and described in *Flight* for September 24th, 1954. The dry system weighs 67 lb and produces the equivalent of about 120 b.h.p., corresponding to a power/weight ratio of only 1.8 b.h.p./lb. A further disadvantage is that the hydrogen peroxide fuel is by no means ideal for ordinary commercial or military use.

If the problem of obtaining boost power for short periods is sufficiently vital to excuse the use of special and (in the case of H_2O_2 dangerous fuels, the most efficient solution would probably be a small reaction turbine connected to the transmission through a light gear train. A modern turbine starter would form a good starting point for such a development and might enable a power/weight ratio of 3.0 b.h.p./lb dry weight to be obtained. Even so, this figure is well below that for a boost ramjet, and it seems safe to conclude that the latter is the most efficient known boost unit.

In Ref. 3 the chief designer to the Marquardt Aircraft Co. presented the curve of ramjet specific fuel-consumption which is shown as a chain line in Fig. 1. This curve represents a "design case" variation, and the specific fuel-consumption of any given fixed-geometry engine would coincide with it only at the Mach number for which the unit was designed. It is apparently drawn for ramjets which are designed to produce the maximum thrust per unit frontal area. For comparison, a curve is included in Fig. 1 for helicopter ramjets, which are designed for minimum fuel consumption, and it is evident that below the speed of sound very important fuel economies can be effected by correct choice of engine geometry. As explained in Ref. 1 the penalty of this low fuel-consumption is that a helicopter unit is nearly twice the frontal area of a "maximum thrust" engine of the same power.



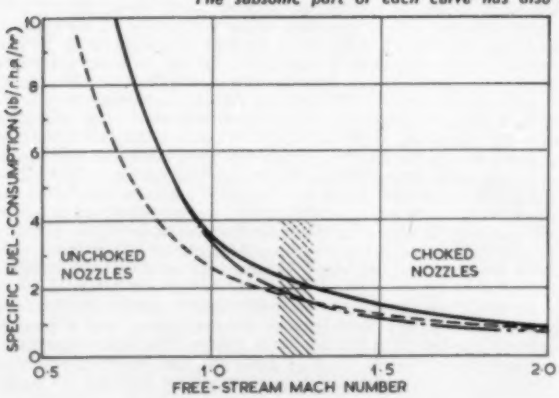
Cut-away view of the Marquardt booster unit.

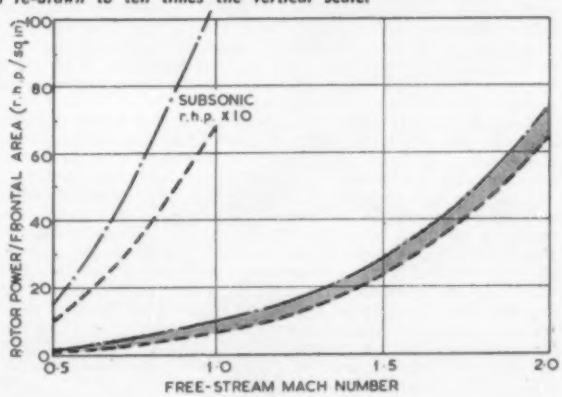
It is interesting to note that the two curves cross over at a Mach number of 1.3. This is due to the fact that around this speed the nozzle of a ramjet runs "full" or "choked," thus limiting the exit velocity. On the ramjets corresponding to the Marquardt curve a Laval nozzle is used to achieve supersonic acceleration of the air after the shock-wave. Because of the great difficulties involved in constructing and cooling such a nozzle on a helicopter ramjet, a plain, slightly convergent nozzle is used. The difference between the two curves is smaller than the efficiency of the respective nozzles would indicate, because of the more favourable geometry of the helicopter engine.

The continuous line in Fig. 1 is for helicopter boost ramjets, the dominating design requirements for which are maximum thrust per unit frontal area, and minimum cold drag. The duality of this requirement leads to a unit whose intake and nozzle areas are rather lower than the optimum for maximum thrust. Once again practical considerations enforce a plain contraction nozzle, but this is in any case the most efficient for subsonic flight speeds. It should be noted that at the speeds at which it is most likely to operate the specific consumption curve of a boost ramjet coincides with the Marquardt curve.

The size of ramjet necessary to produce a given boost can be determined from Fig. 2, where the power per square inch of frontal area is plotted against Mach number for Marquardt ramjets (Ref. 3) and for helicopter ramjets. If, for example, it is required to supply a boost power of 300 b.h.p. for a tandem helicopter with three-bladed rotors, the tip speed of which corresponds to a Mach number of 0.7, Fig. 2 indicates a power

Fig. 1 (left). Variation of fuel consumption with Mach number. The continuous line represents boost ramjets, the chain-dotted line the Marquardt curve and the dotted line helicopter ramjets. Fig. 2 (right). Variation of rotor h.p. with Mach number. The chain-dotted line represents the Marquardt curve and the dotted line helicopter ramjets; boost ramjets fall in the shaded portion between these two curves. The subsonic part of each curve has also been re-drawn to ten times the vertical scale.





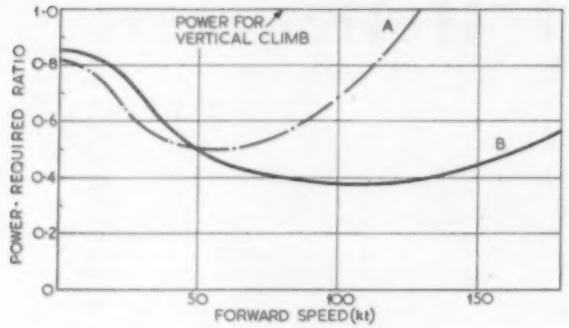


Fig. 3. Variation of power required with flight speed. For both compound and conventional helicopters full engine take-off power is required to climb vertically at 600 ft/min. A=conventional helicopter (high overlap tandem; disc loading, 2 lb/sq ft). B=compound helicopter (rotors off-load to wing; disc loading, 6 lb/sq ft).

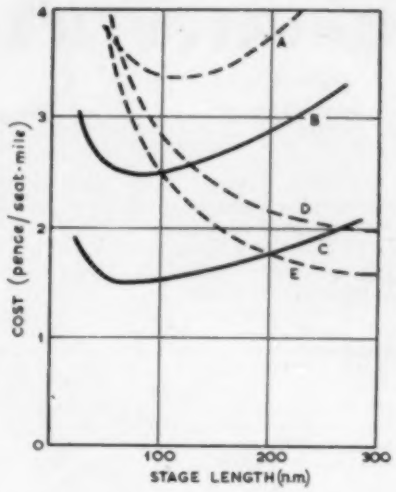


Fig. 4. Direct operating cost of compound helicopters. The shaft drive and ramjet-boosted helicopter are compared with Mr. Peter Masefield's "Beeline Bus" and two fixed-wing B.E.A. aircraft (curves from his 1952 Helicopter Association lecture) for an annual utilization of 2,000 hr. Costs are calculated by the B.E.A. Performance Method. A=Beeline Bus; B=shaft-drive compound helicopter; C=ramjet-boosted compound helicopter; D=B.E.A. Pionair class; E=Discovery class.

BOOSTER RAMJETS FOR HELICOPTERS . . .

of about 3.5 b.h.p./sq in. Thus the frontal area of each tip unit would be

$$\frac{300}{6\times 3.5} = 14.3 \text{ sq in}$$

Harmard[3] quotes a specific weight of about 0.1 lb/b.h.p. based on dry weight of engine plus auxiliaries, but for helicopter engines a figure of 0.13 lb/b.h.p. seems more realistic. Each of the hypothetical tandem units would therefore weigh

$$50\times 0.13 = 6.5 \text{ lb}$$

inclusive of auxiliary equipment such as fuel lines in the blade, etc. A rough guide to helicopter performance is that an increase of one b.h.p. to the rotor increases the payload by 10 lb. At the expense of $6.5\times 6=39$ lb increase in dry weight these units would raise the permissible take-off weight by 3,000 lb. Before this can be expressed as payload increase it is necessary to estimate the extra fuel which will have to be carried. From Fig. 1 the specific fuel consumption is about 11 lb/b.h.p./hr, so that in five minutes take-off and acceleration the engines will consume

$$\frac{11\times 300\times 5}{60} = 275 \text{ lb.}$$

Thus the true increase in payload is

$$3{,}000-(39+275)=2{,}686 \text{ lb.}$$

It seems overwhelmingly evident that boost ramjets are not only of use to heavily loaded military helicopters but could bring a greater improvement in the economics of conventional civil helicopters than could any other single factor.

Compound Helicopters.—Helicopters can be roughly classified under the headings of conventional, compound and convertiplane. The application of ramjets to the first has been discussed above and in Refs. 1 and 2. These references also mention some convertiplane applications, but the fact must be faced that so far as this country is concerned such advanced forms of aircraft are still some distance in the future. It is the compound helicopter, in various forms but with the same end in view, which is currently occupying the thoughts of most project offices and design teams. Definitions vary, but a compound helicopter either has some means of forward propulsion other than the rotors, or one or more fixed wings partially to off-load the rotor in forward flight; or it may combine both methods. The Fairey Rotodyne has both these features, whereas the experimental Bristol 173 helicopter had wings only.

A single wing is more usual, because tandem wings dissipate about 60 per cent more power in cruise than does an equivalent single wing. It is in any case to be expected that no further tandem designs with stub wings will appear, because both their effects—the reduction of vibration by reducing the coning angle, and the postponement of retreating-blade stall—can much more easily be obtained by using rotors with offset flapping hinges.[4] But for cruising speeds of the order of 150-200 kt the addition of propellers for forward propulsion becomes a virtual necessity, whatever configuration is used. This means that during hovering and vertical climb all the power is absorbed by the rotor(s) whilst in cruise the majority goes to the propeller(s). This may be achieved either by connecting both rotors and propellers to the engines with conventional transmission, by gearing the propellers directly to the engines and using some sort of "gas drive" for hovering, as in the Rotodyne, or by an entirely separate boost system as in the S.N.C.A.S.O.

The thermal efficiency of the boost system used for hovering is not very important compared with its weight and cold drag. For this reason a very strong case exists for the use of boost-type subsonic ramjets for hovering and vertical flight in a compound helicopter fitted with conventional turbines and propellers for forward flight. A design-study of a tandem helicopter meeting the B.E.A. specification has been carried out to illustrate this point, and the main results are summarized in Table 1.

Table 1: Compound Helicopter Design-study

	Shaft Drive (Percentage	Boost Ramjets Weight)
Powerplants	8.5	4.3
Lifting and propulsive system	16.2	11.1
Boost ramjets and accessories	—	1.7
	24.7	17.1
Fuel consumption for 1½ hr cruise ...	9.3	7.5
Total	34.0	24.6
Difference	9.4%	
Typical Payload for 1½ hr cruise ...	15.5	24.9

Weights are given as a percentage of all-up weight for the compound helicopter referred to in the text. Specific fuel consumptions of 1.17 and 0.95 lb/s.h.p./hr respectively are assumed. When boost ramjets for hovering are fitted the engine power is halved, and the majority of the rotor transmission removed. Forward flight propulsion-system is the same for both cases.

The shaft-drive version requires sufficient engine power for hovering and vertical climb, and gearboxes, shafting and excess engine weight constitute a large proportion of the weight of the lifting system. When boost ramjets are fitted this weight penalty is removed, and the only transmission retained is the inter-rotor connection and the propeller drive. When the weight of the boost ramjets is allowed for, a total saving of 7.6 per cent of the a.u.w. is achieved, which corresponds to an extra 14 passengers. Moreover, since the engines are selected solely for cruise requirements they can run at optimum cruise conditions. This point is illustrated by Fig. 3, where it is evident that only 40 to 50 per cent of maximum power is required for cruise with the convertiplane, as against 80 per cent for the conventional helicopter at a much lower speed. The specific fuel-consumption of a free-turbine engine operating at half power is considerably higher than for operation at 80 per cent. It follows that for the same cruising speeds the fuel consumption of the shaft-drive compound helicopter will be higher than its ramjet-boosted equivalent. The net result is that the latter can carry 60 per cent more payload at a slightly lower total operating cost; the operating cost in pence per seat-mile is very greatly reduced as shown in Fig. 4, and the aircraft achieves the same economic efficiency as contemporary fixed wing designs for stage distances as great as 250 nautical miles.

It would be interesting to work out a similar comparison between the Fairey Rotodyne as it exists today, and a ramjet-boosted version with thinner rotor blades. The improvement in performance is fairly easy to estimate, but apart from John Brown's Helicopter Association lecture[5] no realistic estimates

are available for the weight of the ducting, rotary seals, hub, tip burners, controls, stability servos, etc., which are the necessary adjuncts to a ducted-air system. In general it is always more reliable to relate studies to aircraft which are either flying or in a fairly advanced stage of design, because the most obvious sources of error are thereby eliminated.

In conclusion, brief mention should be made of the practical development problems involved in producing boost ramjets for both conventional and compound helicopters. Compared with the primary units described in Refs. 1 and 2, starting is no longer a problem, since the gas turbine accomplishes this before the ramjet is ignited. An unusual safety feature of the compounded design is that flight is possible under turbine power alone or by any three of the six tip-mounted boost units. (Technically, we have seven-engine reliability!)

It is obvious that the shutter which blanks off internal flow when the unit is not running should be operated by fuel pressure. When the pilot requires boost power he pushes forward the "boost" lever, which closes the igniter-plug circuit and opens the fuel line. The arrival of the fuel at the unit (at a pressure above 1,000 lb/sq in) might lead to the following sequence: fuel spray commences; ignition takes place whilst the shutter is opening; shutter is fully open and the unit is developing full thrust. It should be noted that a boost unit for a conventional helicopter does not require the fuel flow to be regulated, since only full-thrust operation is required. When the pilot closes the "boost" lever he cuts off the fuel supply, but the unit does not cut out until the fuel in the blade has been burnt, which might take two seconds or more. The extinction of the unit automatically coincides with the closing of the shutter; but, since both shutter position and fuel flow vary with the amount of fuel left in the blade, the unit will "fade out" rather than suddenly stop from full thrust.

These considerations do not apply to a compound helicopter boost ramjet, which would have a built-in metering unit as described in Ref. 1.

References

(1) P. R. Payne: *Subsonic Ramjets for Helicopters*, p. 737, *Flight*, November 19th, 1954.
(2) P. R. Payne: *Supersonic Ramjets for Helicopters*, p. 768, *Flight*, November 26th, 1954.
(3) Malcolm Harned: *The Application of the Ramjet to Aircraft Propulsion*—lecture to the American Society of Mechanical Engineers, December 1952.
(4) P. R. Payne: *High Offset Flapping Pin Rotor Analysis*, p. 378, *Aircraft Engineering*, November 1954.
(5) John Brown: *Some Applications of Gas Turbines to Helicopter Propulsion*—lecture read before the Helicopter Association on October 15th, 1954.

FIRE-FIGHTING CHEMICALS

DURING recent years some notable advances have been made in the development of fire-extinguishing chemicals, and in 1952 a committee was set up by the Fire Research Board (D.S.I.R.) to study the problems involved in the use of what are described as "vaporizing liquid extinguisher agents."

The committee's terms of reference were (a) to review the characteristics desirable in vaporizing liquids for use as fire extinguishers under various conditions; and (b) to advise on tests to assess the suitability of promising alternatives to compounds at present in use. In accordance with these terms, discussion was principally confined to the vaporizing liquids, other media such as foam and powder being excluded.

The committee's report* has now been published. The principal conclusion reached, given in the form of a summary, is that "Some of the newer compounds such as chlorobromomethane and trifluorobromomethane possess considerable advantages over carbon tetrachloride and methyl bromide. The introduction of these newer compounds is therefore recommended in spite of their greater cost, particularly in view of the reduction of the toxic hazards normally associated with the use of these agents. It is not possible, with any compounds at present available, to eliminate the toxic hazards completely."

In an appendix, some notes are given on tests made to study the composition of the atmosphere in the cockpit of a burning aircraft. A part of the investigation was an assessment of the toxic hazard associated with the use of halogen compounds such as chlorobromomethane. The aircraft used for the experiments were Spitfires from which engines and instruments had been removed and undercarriages collapsed. Sand-walls were constructed around the forward ends of the airframes and measured amounts of petrol poured in and ignited. After 75-second delays the fires were attacked.

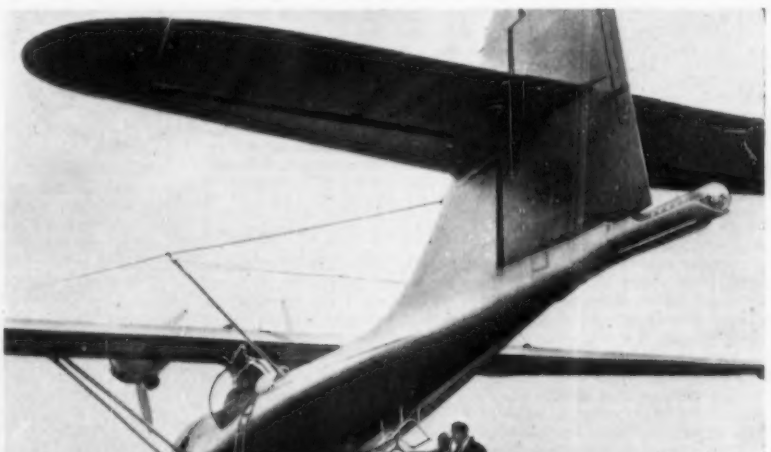
It was found that the quantities of carbon dioxide present were insignificant and that there was no oxygen deficiency except in one test in which the fire was not attacked. None of the carbon monoxide concentrations would create a serious toxic hazard during short exposures. The concentration of acid gases varied considerably with the conditions. Thus, with a large fire not controlled by the extinguishing agent, and when the wind blew the flames back directly over the cockpit, a concentration of 0.21 per cent was observed. With a similar fire, but with the wind blowing away from the cockpit, the concentration was very much lower (0.0006 per cent). Similarly, with fires where extinction was achieved fairly rapidly, the concentration did not exceed 0.03 per cent, even with the wind blowing towards the cockpit.

One incidentally interesting point is that the prices per pound of various extinguishing agents, quoted in a table, range from 4d for carbon dioxide to between £2 10s and £3 for trifluorobromomethane.

*"*Fire Research Technical Paper No. 2: Report of Committee on Vaporizing Liquid Extinguishing Agents.*" Price 1s, Her Majesty's Stationery Office.*

THREE-WAY SURVEY

FOR geological survey duties, a Toronto company, Aeromagnetic Surveys, Ltd., have modified a Canso amphibian (picture above) to carry three types of survey instrument with the object of conducting three kinds of mineral survey simultaneously. A scintillation count is taken by equipment installed amidships, and a magnetometer is mounted in the tail. The receiving head for electro-magnetic equipment is trailed 200ft below the aircraft. Two recorders are installed: one for the electro-magnetic and scintillation-count equipment, together with a radio altimeter, and another for magnetometer reactions. An aerial camera is synchronized to identify pinpoint of readings. Aeromagnetic Surveys are Hunting Group associates.



Not a bomb, but a "bird"—colloquial name for the electro-magnetic receiving unit trailed 200ft below the Canadian Canso amphibian.

THE AERONAUTICAL BOOKSHELF

"Jane's All the World's Aircraft, 1954-55," edited by Leonard Bridgman. Sampson Low, Marston and Co., Ltd., 25 Gilbert Street, London, W.1. Illustrated. Price £4 4s.

ONLY when one has had experience of editing even a small reference handbook is it possible to appreciate the time and effort that go into each annual edition of *Jane's*. With a 45-year-old tradition of excellence to maintain, there must be no mistakes. So, first, hundreds of letters have to be written to firms, air forces and individuals who can supply up-to-date facts and photographs. Inevitably the deadline arrives before the contributions, calling for more letters, airmail letters, cables and telephone calls in that approximate order.

Then come the last-minute editing panics. Two different, completely reliable sources give two different dimensions for the wing-span of the Grumman Gremlin (one of them in metres). And, as soon as the book has gone to press, along comes a stack of glorious pictures of the Lockheed Lockness, a monstrous new amphibian.

All this one bears in mind when reviewing *Jane's*, marvelling the more when the only immediately apparent mistake is in the preface, where the Lockheed XFV-1 is credited prematurely with having taken off vertically.

A few other minor criticisms are possible. The Russian section could well be purged of a few of the more dubious types which are out of place in a work famed for scrupulous accuracy. It is a pity also to see the same poor drawings of Yugoslav aircraft again this year, when good photographs are available. And some of the smaller (mainly helicopter) companies, such as Benson and Convertawings in America and Aerotecnica in Spain, have been ignored completely.

On the other hand, a lot of new names are present for the first time in this edition, including the welcome appearance of F. G. Miles, Ltd., in the British section.

All information is surprisingly up-to-date; and there has been no need for last-minute addenda this year to include photographs of aircraft such as the English Electric P.1, Jet Provost and Midge, which are all in their proper places. Interesting rare birds include a production Skyshark, the Indonesian Wiweko parasol monoplane and the Lockheed RT-33A and QF-80A Shooting Stars. And Jane's appears to have beaten even the official security "down-graders" with details of the Hunter F.3 and F.4.

"A Flier's World," by Wolfgang Langewiesche. Hodder and Stoughton, Warwick Square, London, E.C.4. Illustrated. Price 12s. 6d.

THIS is a glorious book of the air. Its author says that it came into being because he "wanted to convey to those who do not fly something of the strange, topsy-turvy, illogical and wholly satisfying world of the pilot." He achieves this, and more. In fact, there is no book one would rather have one's son read when he is old enough to learn to fly.

To start with, he would learn to treat the air with respect. Says Mr. Langewiesche:—

"You find out in flying that air is not a bland and inert gas; it is strangely live stuff which keeps changing its character, much as if water could suddenly turn itself into wine, then into petrol, then into beer; and then, perhaps, suddenly puff up into a flame. This is because air is not only oxygen and nitrogen, as the books say (plus traces of certain other gasses): it also contains water droplets, water vapour, salt particles, dust, ice crystals, volcanic ash, electricity. It is stirred and re-brewed all the time by the world's countries and its oceans, the deserts, the ice caps, the mountain ranges. So that air flows from place to place as an ever-changing live stream which carries in it all sorts of powers. Often these air streams make a country what it is. When a pilot looks at a place, he sees mostly what the air does to the country and what the country does to the air."

Couple that with his description of the structure of cumulus clouds on pages 146-151—of "the dynamite packed in the puff of wind which picks up a piece of paper"—and the tremendous power of compressibility shock-waves and jet streams is no longer mystifying.

All facts are put over in a way which makes them stick. The reader is first taught what makes an aeroplane fly. Then comes the bigger stuff—"The birds, who ought to know all about flying, cannot fly blind; but men can . . . Flight on instruments is what has allowed aviation to quit fooling and get down to business."

Don't imagine from that that Mr. Langewiesche does not like to see where he is going. Pages 153 to 217 describe a 12,000-mile flight he made to deliver an Expeditor from America to the Far East *via* the North Atlantic route, and his precise impressions of sights, sounds and experiences *en route* are guaranteed to make anybody but a moron hate the sight of his office desk for weeks.

But even these pages are no mere travel diary. Every paragraph contains some item of sound advice which contributes to the overall picture covering everything from the simple basic fact of what keeps an aeroplane up, to the way the pilot of a multi-million-dollar airliner achieves "maximum range cruise" on a transatlantic flight. Oh yes—and "When the little boy in you says: 'Let's fly over and wave at Betty,' you tell him: 'Famous last words. Nix'." About one-third of all fatal accidents in small aeroplanes in America happen to pilots who listen to the "little boys" who have not read books like this.

"Further Outlook," by F. H. Ludlam and R. S. Scorer. Allan Wingate (Publishers), Ltd., 12 Beauchamp Place, London, S.W.3. Illustrated. Price 15s.

ONCE readers have safely passed the gaudy "Lunar-landscape" type jacket picture of a stratospheric glider soaring at a height of more than 18 miles, and the depressing "smog" frontispiece, they will find in this book both a sound treatise and an exciting story. It is the story of the atmosphere, told in a most refreshing manner by two members of the staff of Imperial College Meteorological Department.

In their preface the authors say "To know and enjoy the atmosphere we must watch and read it with purpose and imagination. To understand it scientifically does not rob it of its wonder and charm but rather helps one to know it more intimately and appreciate finer qualities that were previously missed." They go on to describe in turn "The weather we observe," "Atmospheric processes," "The turbulent atmosphere," "Exploiting the atmosphere," "The art of forecasting," "The science of forecasting," "Weather control," and "Uncertainties."

It is unusual for thoroughness, scientific accuracy and imaginative readability to be combined in one book, and in this combination *Further Outlook* is outstanding. This is perhaps because the authors have refused to content themselves with a mere conventional listing of phenomena, conditions and measurements. Instead, they have written a philosophy of weather-study from a new viewpoint, which holds the attention to an extent rare in scientific books.

Certainly every glider pilot, power pilot and meteorologist—and indeed anyone wishing to understand the atmosphere and our knowledge of its behaviour—should read this book. It does not attempt to be an exhaustive text on the science of meteorology, for as Ludlam and Scorer themselves express it: "There are texts for those who wish to delve deeply into the science; for others there is always the sky to watch."

"Sea Flight," by Hugh Popham. William Kimber and Co., Ltd., 46 Wilton Place, London, S.W.1. Illustrated. Price 15s.

IN the words of its author, *Sea Flight* purports to be no more than the more or less factual account of what happened to one Fleet Air Arm pilot between the years 1940-45. Point No. 1 in its favour is that Mr. Popham has no axes to grind, except that he considers the inadequacies of some wartime Fleet Air Arm aircraft were the stiff price the Service had to pay "for its twenty years of servitude to the R.A.F."

His only claim to fame is a wartime newspaper headline which proclaimed "Fleet Pilot with Broken Back Writes £150 Poem." He deplored that, firstly because he injured his spine in a heavy parachute landing *after* he wrote the poem, and secondly because the headline appeared so long before his book of poems was published that the publicity value was negligible!

Inevitably, something of the poet colours his book, and there can seldom have been a better concise impression of the sights and smells, the noisy efficiency and graceful beauty of an aircraft carrier than his description of H.M.S. *Indomitable* on pages 64-7.

He gives a joyous account of his early training in Britain and in Canada, where in a light-hearted moment he flew under the International Bridge near Lake Ontario in a Battle trainer. There are excellent if not always complimentary comments on the types of aircraft he flew throughout his career and which convinced F.A.A. pilots that the odds in action would inevitably be unfavourable. Nevertheless, comments Mr. Popham, "high odds and indifferent weapons, if attended with occasional successes, breed a perverse pride in those who suffer from them."

The pride was somewhat bent when *Indom* went aground at Bermuda in 1941, and the entire ship's company had to bounce rhythmically up and down on the deck, to the strains of a Marine band, to try to shift her. It survived the humiliation of having to avoid a clash with the Japanese Navy in the Indian Ocean in April 1942, because the result would almost certainly have been the annihilation of our much smaller force, including two precious

THE AERONAUTICAL BOOKSHELF . . .

fleet carriers. It shines through the record of Malta convoy battles and the author's last journey in H.M.S. *Campania* as part of a Russian convoy escort, after he had been made to exchange the cockpit of a Seafire for a pair of D.L.O.'s bats.

There is plenty more to make this book both interesting and readable. An account, for instance, of how *Indom's* Hurricanes landed at an American air station "in formation, two and three abreast, and so close on each other's tails that there were eight and ten aircraft on the duty runway at a time"; a note on the Blimpish attitude of members of Colombo Flying Club who objected to having their circuits and bumps interrupted by F.A.A. pilots returning from anti-submarine patrol in 1942; and a never-before-published description of the first crude g-suits, which the author helped to test in 1943.

"Flying Saucer from Mars," by Cedric Allingham. Frederick Muller Ltd., 110 Fleet Street, London, E.C.4. Illustrated. Price 10s 6d.

AN old Scots prayer asks divine protection from "long leggity beasties and things that go bump in the night." The author of this book claims that, on 18th February 1954, he had a personal interview with a long leggity (6ft-tall) Martian, who emerged from a flying saucer that bumped down near him in broad daylight, while he was strolling along the coast near Lossiemouth. Far from being afraid, he believes that such visitors from space may try to protect us from ourselves now that we have learned to play with thermonuclear toys.

If the reader believes that George Adamski (author of *Flying Saucers Have Landed*) and Cedric Allingham are merely clever hoaxers, he will note that the only sharp, entirely convincing photograph in this book is the frontispiece picture of the author himself. Indeed, his "Martian" looks awfully like an Englishman in a frogman's outfit, and pictures of the saucer look decidedly artificial.

If, on the other hand, the reader is numbered among the believers, he will be pleased to learn that the great astronomer, Charles Messier, reported seeing strange objects "like ships, yet like bells" in the sky in 1777. Then, of course, there were the "saucers" seen in June of this year by Capt. Howard of B.O.A.C. and his crew; others reported by the eminent astronomer, Dr. H. P. Wilkins; and that photographed by two schoolboys at Coniston three days before Mr. Allingham's "meeting with a man from Mars."

Mr. Allingham quotes another "famous astronomer . . . [who] holds a Chair at a British University" as saying that: "We think our saucer photographs are good, don't we? Well, it's a pity we can't see the files of the Royal Air Force, or the collection they've built up at Palomar. Believe me, they've *really* got some marvellous ones!"

Surely if this is not true, it would be easy and worthwhile for the Air Ministry and the authorities at Palomar to say so, officially. Otherwise the editors of aircraft recognition books will tend to become very depressed about the future; for the only external difference between interplanetary aircraft built millions of miles apart in the solar system seems to be that Martian saucers have their portholes in groups of three and Venusian in groups of four.

* * *

A NEW catalogue of German aviation literature has been prepared by Aero-Verlag Hubert Zuerl, Hermann-Lingg-Strasse 9, München 15. Copies are obtainable in exchange for coupon to cover the cost of postage.

STRICTLY UTILITY

More Passenger-reactions to Russian Airline Travel

THE following impressions of Russian airline travel confirm and add to those of another recent traveller, recounted under the heading "Sino-Soviet Tour" in our issue of October 1st this year. The present notes are by a visitor who was with a party organized on an exchange basis with the National Union of Students. This, he says, gave them a semi-official status and, although none was a Communist, reception was warm and treatment friendly.

WE flew in a chartered aircraft from Bovingdon to Prague, where a Russian machine took over, for none but Russian aircraft land in the U.S.S.R.—not even those from the satellite countries. When Mr. Attlee's party went to Russia recently, they changed aircraft at Helsinki; and the recently-concluded Franco-Soviet agreement for Paris-Moscow flights provides for the Air France services to go only as far as Prague. Incidentally, Prague Airport, and all others on the far side of the Iron Curtain, greets the traveller with slogans in French, German, English and Russian; a typical example is: "Peace Can be Kept —Peace *Must* be Kept."

The Russian airliners are mostly of the twin-engined Ilyushin Il-12 type, which is internally rather like the Viking. Instead of 32 seats, however, there are 21, seven double on the left and seven single to the right; thus the gangway is reasonably wide.

After taking off without any preliminary engine warm-up we flew to Minsk, in White Russia, in about three hours, at a cruising speed of around 180 m.p.h. I cannot be more precise, since no flight information was passed round. And I have to confess that I did not fasten my seat-belt during any of my flights; there was none to fasten. Nor were there seat lights.

The upholstery was worn, cracked and faded and would long have been discarded by any European airline. But ordinary commercial considerations do not matter in Russia, where the State owns all and the State sells all. A curtain and pelmet over the doorway leading to the cockpit gave a Victorian touch.

At Minsk we had a forty minutes' stop for refuelling and for food in the airport restaurant. This was scarcely time to deal with a meal chosen from a menu which was a twenty-page octavo-sized booklet containing (with names in Russian, Chinese, English, German and French) over thirty choices of hors d'œuvre, twelve of soups, twelve of fish, twenty-two of meat, ten of game or poultry, fifteen of vegetable, milk and egg dishes and nine of dessert or fruit, with confectionery and drinks of all kinds. Not every item was available every day—but I pass the hint on to London Airport all the same!

The same hostess was aboard when we took off for Moscow—a well-built woman of about thirty, in housewifely frock and white cotton blouse. She wore no insignia. When not busy she sat on an upturned box behind the rear passenger (on another flight she occupied one of the vacant passenger seats). No chewing-gum or barley-sugar was brought round. There was no galley, but there was a pantry where cold snacks like cheese rolls or meat sandwiches were kept—and a samovar. Tea is never served in cups in Russia, but in glasses in their metal holders.

There is an utterly charming informality about the workings of Aeroflot. We were all in our seats, and the aircraft was about to take off, when I heard a hammering at the entrance door. The banging continued vehemently. "Wait!" called the stewardess to the pilot. And she opened the door, to reveal a tardy passenger, laden with two brief-cases, demanding entry. He was hauled up, the door shut again, and we took off.

Stewardesses—after 100 hours' flying—are paid 900 roubles a month (at 35 to the £, which is as fair a rate of exchange as I have been able to establish, this would equal about £6 5s a week).

Moscow airport demonstrated the Russian phobia where the foreigner's camera is concerned. Some of my party were standing with their backs to the handsome administration building, posing for a holiday snapshot, when an official warned us to desist. No aircraft would have appeared in the photograph. I was able later to set that incident against the scene at Frankfurt Airport, where cameramen even climbed the steps to snap celebrities as they emerged from their aircraft.

Another flight I made—on a similar type of aircraft—was southward to Stalingrad, scene of such desperate fighting during the war. The airfield here is a large, sandy, sun-baked plain, with a few wooden buildings. My taxi drew up right alongside the aircraft, drove off the field and on to the main road which led to the city. There were neither gates nor fences.

But air traffic here is very light. The city, all but wiped out during the war, is slowly returning to its pre-war population of half-a-million. But then traffic was light at every airport I used. There can be little flying for pleasure, for the average man cannot afford it. As to flying on business—whose business? There is no private enterprise in Russia. With few exceptions everyone works for the State, so what flying takes place is almost entirely official.

Yet the picture may change in the near future, for moves are taking place concerning the reopening of an Intourist office in London; this I gathered from a vice-president of the agency. If and when British holidaymakers are once more allowed in Russia they will want to visit the semi-tropical resorts on the Black Sea coast. B.E.A. already fly to Istanbul, nine-tenths of the way; so should the Iron Curtain at last be lifted we may yet find British aircraft carrying us to Yalta, Sochi, Sukhumi and other Black Sea pleasure resorts. In my Russian flights I badly missed the comfort and friendliness so familiar on the Elizabethans and Viscounts.

DORE SILVERMAN.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

TV Shortcomings

I MUST regretfully agree in general with the strictures passed by your correspondent Mr. T. N. Simpson [December 10th] on the current TV series *War in the Air*. What a missed opportunity this has been!

I differ from Mr. Simpson in that I consider that the films have improved somewhat since that feeble introductory effort—there has been less intrusion of obviously staged scenes in the later episodes.

But why title the films *War in the Air*, and yet spend so much valuable time (and money) on scenes that have no conceivable air interest? Until the advent of the atom bomb, the late war was like all previous wars in that most of the important battles were essentially decided by armies and/or navies, and the films have reflected that historical fact instead of showing *air* power in *all* its fascinating aspects, even when a mere supporting arm. So it comes about, as Mr. Simpson says, that the operations by Hampdens and Whitleys (among many significant types) have not been featured at all.

Your reviewer, "M. F. A.," mentions one series of shots, ostensibly of Cologne after the first 1,000-bomber raid, that was (as he implies) most glaringly out of period. There have been several such examples which, whether errors or the result of careless editing, are really inexcusable; to quote only one—who saw FW 190s in the Battle of Britain?

Has the Air Ministry changed its mind again on the losses of, e.g., September 15th, 1940? Because in the film commentary we were served up the original British figures long since officially refuted! ("M. F. A." picked on this point also.)

And how have the B.B.C. contrived to make so much of the air war so positively *dull* and uninspiring?

Croydon, Surrey. G. D. H. LINTON.

IN his letter on the B.B.C. television film (*Flight*, December 10th) Mr. T. N. Simpson asks "Is there so little film available from these early years of the war?"

The answer is, unfortunately, that very little is, indeed, available. Much of the surviving film is of such a poor quality that it was not considered suitable for inclusion and most of the good shots available were taken by the newsreel companies, whose current agreement prevents their use by television!

I have heard, however, that an improvement can be expected for the remainder of the series, as the American Forces, now in the war, were much more camera-conscious than were their British counterparts.

London, S.E.19. M. F. A.

THE B.B.C. series *War in the Air* has evoked much comment from many quarters. The latest and, I think, least tolerant, was from T. N. Simpson (*Flight*, December 10th, 1954). He says: "Considerable footage was wasted on 'Workers' Playtime.'" There are so many aspects to war in the air, each one a history in itself, that those who had to choose from 15,000,000ft of film (their reckoning) must have had some job. One must also remember that this is a television series, a medium not acceptable to some subject-matter.

Remember, too, that the war in the air, and all it achieved, started from the earth. Aircraft, tanks or even battleships are not born—they are made! Believe me, despite all that has been said, "Maximum effort" meant, in lots of cases, 12 to 14 hours a day (or night) in the factories, offices, etc. To this may be added such spells when "war in the air" sent us for another two hours or so to a shelter. The factory canteen to some of us was part of our life; our morale. The patter, the jokes, the music, made us "go to it."

As for Hampdens and Whitleys, I thought some of the internal shots were in these aircraft. The dear old zip-sided bomber was also included.

Bristol. ON THE GROUND.

Taffy Weighs In

I WRITE for three reasons, first to thank you for your excellent review of my book *Tiger Squadron*. After reading it, it was clear to me that the reviewer did not appreciate that I only believe in shooting-up dangling airmen who are obviously *going to land in their own territory*. The reason? "That guy" may be the type who will later in life blot me out!

Secondly, concerning Erika Zahn's letter comparing the dates in *Tiger Squadron* and in *War Birds*. Elliott Springs is an old friend of mine; however, I must say that if your correspondent wants to make a bet I suggest she backs the *facts* in *Tiger Squadron*!

Thirdly, TV's *War in the Air*. I enjoy your weekly comments. I feel the series is smouldering instead of blazing. It is normal entertainment instead of being superb.

Carmarthen, S. Wales. TAFFY JONES.

Aircraft in the Antarctic

IN your issue of November 12th, Mr. Grierson chastises me, not only for having criticized Capt. John Giever, a respected friend of mine, leader in the field of the Norwegian-British Antarctic Expedition, but also for showing signs of international rivalry.

It is difficult to understand this reaction, as the only reason for my letter in *Flight* for October 22nd was to put down some facts which might be of an interest for readers of your internationally known magazine who do not belong to geographical circles in England.

The first and main part of the book, covering the expedition, was written by Capt. Giever in an attractive style and the book has been printed in many languages. In air matters, however, the British edition differs considerably from all the other editions, presumably due to circumstances in England beyond the control of Capt. Giever.

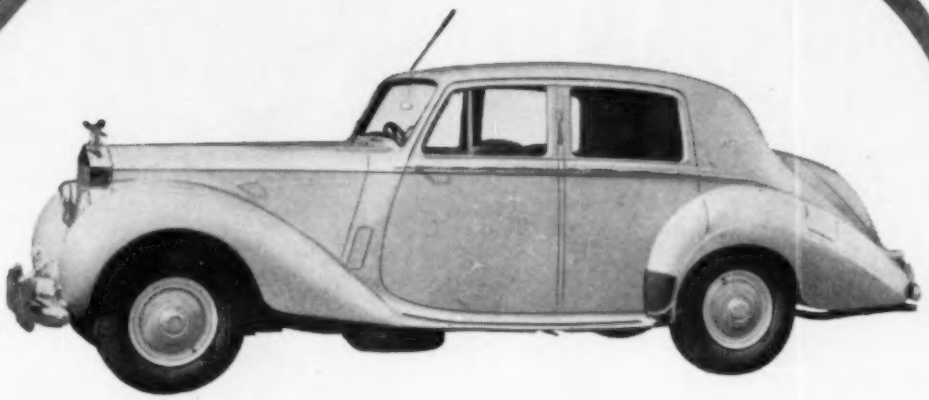
I am the first to admire the excellent international co-operation in the field during the expedition, which I had many good opportunities to watch during my two visits in the Antarctic. Having no feeling for international rivalry, I was proud of being able to get some international co-operation in the air unit of 1951-52, too. I am glad to have this opportunity to point out the excellent work done and the good fellowship shown by the Norwegian member of the unit, the photographer Helge Skappel, and the temporary British member, Lt. Dave Blair, R.N.

Stocksund, Sweden. R. v. ESSEN.

FORTHCOMING EVENTS

Jan. 4. Institute of Refrigeration: "Ground and Airborne Equipment for Cooling Aircraft Cabins," by N. Anderson.
Jan. 4. R.Ae.S. Section Lecture: "Recent Advances in the Knowledge of Transonic Airflow," by C. H. E. Warren, M.A., A.F.R.Ae.S.
Jan. 6. Institute of Metals: "Some Aspects of Twinning and Kinking in Metals," by Prof. A. H. Cottrell, Ph.D., B.Sc.
Jan. 6. R.Ae.S. Main Lecture: Lecture to young people, by P. G. Masefield, M.A.(Eng.), F.I.A.S., F.R.Ae.S.
Jan. 8. British Interplanetary Society: "Using Hydrogen Peroxide," by A. V. Cleaver, F.R.Ae.S., and "Liquid Oxygen as a Rocket Propellant," by S. Allen, M.I.Mech.E., A.F.R.Ae.S.
Jan. 8. British Interplanetary Society (Midlands branch): "Spectroscopy in Astronautics," by W. H. T. Davison, M.A.
Jan. 14. Helicopter Association: Brains Trust.
Jan. 15. British Interplanetary Society (North-west branch): "High-Speed Flight," by R. J. Boor, A.M.C.T.
Jan. 15. Women's Engineering Society: New Year luncheon.
Jan. 18. R.Ae.S. Section lecture: "Manufacture of Integral Structures," by Dr. E. G. West, Ph.D., B.Sc.
Jan. 22. British Interplanetary Society (provisional Yorkshire branch): Short-paper evening.
Jan. 22. British Interplanetary Society (provisional Western branch): "Engineering Problems in the Construction of Satellite Vehicles," by G. L. Garthwaite.
Jan. 24-28. Institute of the Aeronautical Sciences: 23rd Annual Meeting and Honors Night dinner, New York.
Jan. 25. British Interplanetary Society (provisional Scottish branch): Brains trust.
Jan. 25. R.Ae.S. Graduates' and Students' Section lecture: "Test-flying a V-bomber," by S/L. H. G. Hazelden, D.F.C. and Bar, and R. H. Williams, B.Sc., A.F.R.Ae.S.
Jan. 27. R.Ae.S. Section lecture: "Dynamic Problems of Interplanetary Flight," by D. F. Lawden, M.A.

R.Ae.S. Branch Fixtures (to Jan. 20):—
Jan. 3, *Belfast*. "Model Making," by T. Gowan. Jan. 5, *Brough*, "Domain of the Helicopter," by R. Hafner; *Chester*, "Aircraft Wheels and Brakes, Development Testing," by F. W. Dryland; *Gloucester*, "Developments in Aviation in European Countries," by P. B. Locke; *Luton*, Junior Night. Jan. 6, *I.O.W.*, "Case for the Light Fighter," by P. A. Norman; *Yeovil*, "Air-to-Air Photography," by L. Russell-Adams. Jan. 10, *Halton*, Films. Jan. 11, *Boscombe Down*, "Domain of the Helicopter," by R. Hafner. Jan. 12, *Southampton*, A.G.M. and film show; *Weybridge*, "The Mechanical Test Department: Its Organization and Function," by J. H. Cork; *Manchester*, "Hydraulics," by E. J. Nicholl. Jan. 13, *Glasgow*, Film evening. Jan. 14, *Birmingham*, visit to Wolverhampton.
Jan. 17, *Halton*, "Compound Engines," by E. E. Chatteton. Jan. 19, *Coventry*, illustrated talk by Dr. A. M. Ballantyne on visits to overseas divisions of R.Ae.S. Jan. 20, *I.O.W.*, "*Titanium*," by Maj. P. L. Teed.



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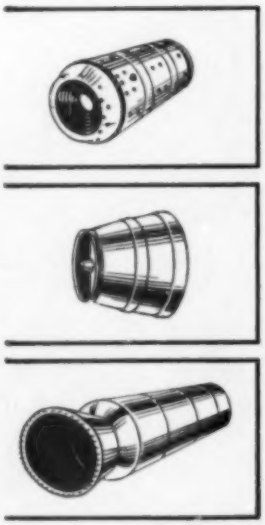

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CIVIL AVIATION

B.E.A MAINTENANCE HOLD-UP AVERTED

THE chief executive of B.E.A., Mr. Peter Masefield, took prompt and firm action to avert the threat of an interruption of the Corporation's services just before the start of the busy Christmas period. The threat arose from a mass meeting held on December 17th, in defiance of instructions, by 315 engineers at the Corporation's London Airport maintenance base.

At this meeting the men passed resolutions banning overtime and imposing a "go slow" in protest against B.E.A.'s refusal to meet the demand of one shop steward, Mr. J. Peters, for permission to conduct his trade union activities on a full-time basis at the Corporation's expense. B.E.A. had earlier granted Mr. Peters 11½ hours' paid time each week for these activities, but he continued to demand unlimited paid time for his shop-steward duties, and in doing so he ignored the agreed channels of joint consultation between employees and management.

These demands culminated in the mass meeting on December 17th. As a result, B.E.A. served notices of immediate dismissal on the 315 engineers who took part.

At the suggestion of Mr. J. Matthews, Trades Union Secretary of the National Joint Council, Mr. Masefield agreed that all those dismissed could present themselves for re-engagement the following Monday. By Wednesday, December 22nd, the majority had been re-engaged "with no recriminations and no penalties" after signing an agreement that in future they would follow the proper constitutional machinery for settling disputes.

ITALIAN DC-6B LOST

WHILE making a bad-weather approach to New York International Airport on December 18th, DC-6B I—LINE, operated by the Italian airline L.A.I., struck a jetty and crashed into Jamaica Bay. Of the 32 people aboard, including a crew of ten, six passengers survived.

NEW FERRY SERVICE APPROVED

MIDLANDS and northern motorists will be provided with an air ferry service to the Continent by a new Silver City Airways route, scheduled to begin on May 1st, 1955, which has just been approved by the M.T.C.A. The 200-mile route, from Elmdon, Birmingham, to Le Touquet, will be flown in 90 minutes by Bristol Superfreighters, operating at an initial frequency of one to three services daily. Fares have not yet been approved, but it is expected that vehicle owners will pay roughly twice as much as the rates on the existing short Channel routes, and that the passenger fare will be about £8 single. Between January 1st this year and November 30th, Silver City carried nearly 30,500 cars across the Channel, compared with 24,000 last year.

K.L.M. NEWS

WING-TIP fuel tanks holding 600 (U.S.) gallons each will be fitted to the four Super Constellations ordered by K.L.M. for delivery in 1956. At the same time these tanks will be fitted to four of the Super Connies already in service with K.L.M. One of the similar aircraft due for delivery to T.W.A. shortly will also be equipped with tip-tanks, which increase the range of the Super Constellation by 850 miles to a still-air absolute figure of 5,840 miles. This will enable K.L.M. to operate an increased proportion of their flights direct from Amsterdam to New York.

Registrations and names of these four L.1049G Super Connies (those in service are L.1049Cs) will be PH-LKE *Pegasus*, PH-LKF *Phoenix*, PH-LKG *Griffioen* and PK-LKH *Roc*.

K.L.M. have also announced that Gen. J. A. Bach, who is at present in charge of purchasing and maintaining the equipment of the Royal Netherlands Air Force, will join the airline as vice-president (operations) on May 1st. Gen. Bach, who is 49, is one of the most versatile personalities in Dutch aviation, having been a naval pilot, an air force pilot, a civil flying instructor, a K.L.M. and K.N.I.L.M. pilot, a test-pilot with the pre-war Koolhoven works, a blind-flying instructor, the commander of a fighter squadron, an aviation journalist and manager of the Government Civil Flying School. He has logged some 8,000 flying hours on 50 different types of aircraft. Moreover, he has been for some time a student of law and a dentist.

HERONS FOR B.E.A.

AS forecast in *Flight* of November 26th, B.E.A. are to purchase de Havilland Herons to take over work now done on their Scottish routes by Rapides. The Corporation announced last week that two Herons (of the Series 1 fixed-undercarriage variety) would be delivered early in the new year for introduction to service before the spring.

Their initial function, it was stated, was to replace the Islander-class Rapides used by the Air Ambulance Unit, which is based at Renfrew. Operated under charter to the Department of Health for Scotland in association with the National Health Service, this unit has carried over 2,500 sick or injured people from the Western Isles and other remote areas to the mainland over the past eight years. Its work has involved nearly 2,200 flights, often in extremely bad weather.

Re-equipment with Herons will enable the unit to carry its patients faster and in much greater comfort without sacrificing the ability to operate from the undeveloped landing grounds used by the Rapide—e.g., the beach at Barra. Basically, the B.E.A. Herons will be 14-seaters capable of quick conversion to ambulances by the installation of a tubular frame for two stretchers.

It is stated that the new aircraft will also be used to operate the regular passenger service between Renfrew and Barra. The Heron would appear to be suitable for operation on other low-density routes in Scotland, and it is thought that the Corporation might later decide to increase its order. A Heron service to the Scilly Isles might also be reconsidered.

Though the type was not backed by an initial home order the Heron has achieved considerable export success. The aircraft's popularity among operators of low-density services in comparatively remote areas should dispel any doubts which may exist as to its suitability for its new rôle with B.E.A. In fact, many people may wonder why the Corporation's order was not placed sooner, since neither the Heron's performance nor the requirements of the Scottish "outback" services appear to have altered since B.E.A.'s original evaluation of the aircraft as far back as 1951.

This question was to some extent answered in the B.E.A. annual

This was the snowy scene at Dorval Airport, Montreal, on December 12th, when T.C.A.'s first Viscount completed its delivery flight from Wisley via Prestwick, Keflavik, Bluie West One and Goose Bay.

CIVIL AVIATION . . .

report for 1951-52, which said that the Heron partially met the Corporation's requirements for a Rapide replacement, but that it did not "meet all the economic factors sought in the Specification of Requirements for a Rapide Replacement which was issued by B.E.A. to the Industry in August 1949." In response to this specification two firms (Blackburn and Short) submitted designs for 12-seaters powered by four 145 h.p. Gipsy Majors. The Government had refused to pay for development of these designs and, in view of earlier expenditure on the Marathon, had, in 1950, requested B.E.A. to replace their Rapides with a fleet of Marathons.

Though emphasizing that the 18-seat Marathon was regarded as too large for economic operation on the Scottish routes, B.E.A. agreed to this request. The Corporation was released from this undertaking in April 1952 and the Marathons were never delivered. Since then Pionairs (Dakotas) have been substituted for Rapides wherever possible, but the only published news of a B.E.A. Rapide replacement as such is the Heron order announced last week.

In B.E.A. service, Herons will belong to the new "Hebrides" class. Registrations and names will be G-ANXA *John Hunter* and G-ANXB *Sir James Young Simpson*; the names are those of eminent Scottish medical men.

T.C.A. SUPER CONSTELLATION DESTROYED

ALL of the 23 occupants—16 passengers and seven crew—escaped with injuries from a T.C.A. Super Constellation which crashed in a field near Malton Airport, Ontario, on December 18th. The aircraft was completely destroyed by fire.

FRIENDSHIP PRODUCTION PLANS

AN announcement from Mr. Frits Diepen, commercial director of the Fokker works, states that serious production of the twin-Dart Fokker F.27 Friendship will begin next month. The first of the two prototype Friendships now under construction is due to fly in the summer of 1955. It is estimated that the company will need to sell 50 or 60 of these 28-36-seat transports, at a price of about £175,000, to break even. It is reported from Holland that large-scale sub-contracting will be necessary in the production of Friendships, since the productive capacity of the Fokker Amsterdam factory will be largely taken up by Hunters and S.14 jet trainers.

WITH A BONANZA IN ADEN

ON pages 934-937 of this issue the Editor gives his impressions of handling the Twin-Bonanza flown across the Atlantic recently by Nils Hulten *en route* to his company's headquarters in Aden. Readers may wonder how this Swedish pilot came to take up commercial flying in the Near East. This explanation is given in *The Beechcrafter*, house journal of the Beech Aircraft Corporation: "Working in Sweden, he once flew to Egypt to sell an airplane [a Saab Safir] . . . the buyer was the King of Yemen, a small Arabic state north of Aden, who insisted that Nils come along as part of the bargain."

Since 1949 Hulten has been flying a Bonanza for the Aden firm of A. Besse and Co., whose interests include an exporting and importing business, hotels, a soap factory and fuel distribution. The Bonanza, he reports, has performed magnificently for over five years, operating from short strips at take-off altitude of up to 8,000ft.

Practically the only untoward incident occurred in 1949, when engine trouble caused a precautionary landing in a dry river bed. The aircraft was immediately surrounded by Dankali tribesmen, who demanded a "landing fee" of more than £3,000. Hulten explained that he had no money and gave them a letter to the nearest of his company's offices; surprisingly, perhaps, the natives conveyed his message, and the police settled the question of ransom money. Meanwhile, Hulten (who is his own mechanic) had traced the trouble to a filter in the carburetter, which was choked by chamois-leather "fuzz."

Before returning to Aden with his company's new Twin-Bonanza, Hulten will visit his native Sweden.

BREVITIES

IT is reported from Australia that T.A.A. have decided to buy a seventh Viscount to replace the aircraft (the first of their new fleet) destroyed in a training accident near Melbourne last month.

* * *

The national airline of Costa Rica, LACSA, has ordered two Convair 340s for service between the new airport at El Coco (near San José, the capital city of Costa Rica) and Miami. The aircraft, together with spares, will cost some £570,000, of which £320,000 is being advanced by the American Export-Import Bank.

* * *

Substantial salary increases were awarded to Australian airline pilots earlier this month by an arbitration court. Some 900 pilots benefit from the awards, which increase salaries of Grade 1 captains by about £A350 to £A2,375 and those of Grade 2 captains by £A300 to £A2,080; sterling equivalents of these salaries are £1,900 and £1,664 respectively.

* * *

Both decorative and useful, a coloured map of B.E.A. European routes, measuring 44in by 34in, has been published by George Philip and Son, Ltd., 30-32 Fleet Street, London, E.C.4. Its *motif*, attractively illustrated by numerous small drawings, is the different occupations and industries of the various communities. Printed on stout paper, the map costs 4s 6d.

FROM THE CLUBS

IN its recently published report for the year ended June 30th, 1954, the Association of British Aero Clubs and Centres records that during this period four additional clubs were elected to full membership, six to associate membership and two to affiliate membership. Two full members, one associate member and four affiliate members resigned—all as a result of the winding up of the clubs concerned. Membership at the end of the year reviewed stood at 46 full members, 29 associate members and ten affiliate members.

Acknowledging co-operation afforded by the Air Ministry and the M.T.C.A., the A.B.A.C. report refers to a number of matters in which it conducted successful negotiations on behalf of member clubs. Representations were made to the M.T.C.A. against the recent ruling that student pilots who did not complete their P.P.L. training within six months would not receive the benefit of the 30-hour approved course; as a result, the Ministry agreed that in such cases application for a licence would not be automatically rejected but would receive consideration according to the merits of the case.

Recent progress of the club movement is shown in the report by comparative statistics for the years 1948-1953 inclusive. The number of aircraft operated by A.B.A.C. clubs increased from 219 in 1952 to 245 last year, but the average utilization dropped from 310 to 269 hours. Total club membership increased from 11,582 in 1952 to 12,477; the drop in total flying hours (from 68,066 to 65,890) was attributed to bad weather in the summer of 1953

First ultra-light aircraft to be officially approved by the Popular Flying Association (see item below) is the Druine Turbulent (left). Approval is also likely for the Turbi, seen in the companion view.
"Flight" photographs

and to the decrease in A.T.C. scholarships during the change-over to a new method of selection.

For the period covered by the report 500 flying scholarships were awarded to A.T.C. cadets, and for the year ending March 31st next a further 400 were allocated, making a total of 1,975 since the inception of the scheme. On June 30th, 1954, 1,179 cadets had completed P.P.L. courses and 54 more had reached solo stage. The names of 152 club pilots had been submitted to Home Command for approval to participate in the Air Experience Scheme [under which club members can hire aircraft at greatly reduced rates when carrying A.T.C. candidates] and 138 had been approved.

As announced last week, H.R.H. the Duke of Edinburgh has consented to become patron of the A.B.A.C.

A RECENT and most important concession to the ultra-light movement was the M.T.C.A. decision to accept recommendations from the Popular Flying Association as to the airworthiness of aircraft weighing less than 1,200 lb and having an engine of not more than 75 h.p. The first type to be so recommended is the Druine RD.4 Turbulent, which has now received official approval from the Association. The P.F.A. has also announced its intention of approving the Turbi, a two-seat development of the Turbulent, but states that its approval will not be restricted to these types alone. It hopes that both manufacturers and amateur constructors will take advantage of the new procedure.

Plans and further information can be obtained from the Popular Flying Association at Londonderry House, Park Lane, London, W.1.

PILOT FATIGUE

LEGISLATION to limit airline pilots' flight-time for reasons of safety has been recommended in a recent memorandum from the British Air Line Pilots' Association to the M.T.C.A. and operators. Commenting on the memorandum in London on December 16th, Capt. J. Woodman, chairman of the Association, emphasized that the problem had not come to light after recent accidents: it had been under consideration for some time. The system whereby flying hours were limited by agreement with employers had not worked as well as B.A.L.P.A. would have wished.

The co-ordination of the pilots' views and drafting of the recommendations was carried out by a sub-committee headed by Capt. P. E. Bressey, of B.E.A., who pointed out that a pilot's most critical decisions—during the transition period from an I.F.R. let-down to a visual landing—often had to be taken at the end of a long flight or a long working day. At present the only mandatory requirement was that a medical examination should be taken if a pilot flew a total of 125 hours in any 30-day period, and there was no limitation to the hours flown per day.

Part one of the memorandum discusses the need for regulations on flight-time limitations, and in particular the changing operational pattern, the shortage of qualified pilots, and the increase in the tempo of work. After submitting that the transference to the operator of responsibility for avoiding excessive flight times had not worked, the memorandum continues, "Excessive hours have been scheduled by both large and small operators and it is our considered opinion that those hours have led to such fatigue that safety has been prejudiced. In some cases this may well have contributed, we believe, to serious accidents, but these are no measure of the true scope of the problem; this should be measured rather by the potential accidents, the near-misses and the landings made without incident merely because the weather was fortuitously good."

The protection required by public and pilots, the statement goes on, should stem from precise governmental legislation, as had been accepted by Australia, the U.S.A., New Zealand, France, South Africa and Belgium.

The factors to be considered in the problem of crew fatigue, the memorandum states, are (a) the type of operation, (b) the length of time on duty, (c) the time of commencement of duty and (d) the intensity of the work. In the specific recommendations made, short-haul, medium-haul and long-haul operations are defined as those having an average flight stage (number of flying hours per day divided by the number of stages per day) of less than three hours, three to four hours and over four hours respectively.

For short-haul operations, the Association proposes that the maximum duty day should be ten hours for a day flight and nine hours for a night flight. The minimum time available for sleep between two successive duty days should be eight hours or, in exceptional circumstances, six hours. If any duty day exceeds eight hours or the crew consists of no more than two persons, the following time available for sleep must be at least eight hours. Two consecutive night duties should not be scheduled.

Periodic limitations for short-haul operations should be as follows:—

	hr
Maximum duty time in seven consecutive days ...	50
Maximum flying time in one calendar month	100
Maximum flying time in one quarter	255
Maximum flying time in one calendar year	935

The figures for medium-haul operations are based on a minimum crew of two pilots and one radio officer. The memorandum suggests a maximum duty day of 12 hours (day) and ten hours (night). The minimum period for sleep after one duty day should be eight hours, all falling between 2200 hr and 0800 local time. As for short-haul operations, two consecutive night duties should not be scheduled. Periodic limitations for medium-haul operations should be the same as those for short-haul flying.

Separate recommendations for long-haul operations are made according to whether two or three pilots are carried. In the case of the three-pilot crew it is assumed that adequate sleeping accommodation for the off-duty pilot is available in the aircraft. For a two-pilot crew the maximum duty day should be 16 hours for a day flight and 13 hours for a night flight. Minimum time available for sleeping after one duty day should be eight hours, all between 2200 hours and 0800 hours local time. The periodic limitations for a two-pilot crew should be as follows:—

	hr
Maximum flying time in one calendar month	120
Maximum flying time in one quarter	300
Maximum flying time in one calendar year	1,000

For a three-pilot crew the maximum duty day should be 22 hours (day) and 19 hours (night). The minimum time available for rest between two successive duty days should be 48 hours, and the periodic limitations should be as for the two-pilot crew.

Eventually, Capt. Bressey stated, the Association hoped that flight hours would be written into pilots' contracts. Such flying times would be calculated on a social basis, however, in addition to considerations of safety. B.A.L.P.A. was fundamentally interested in safety, however, and the present memorandum was concerned simply with that aspect of flight-time limitations. The Association took part, at the invitation of the M.T.C.A., in the deliberations of a working party considering air crew fatigue, and it hoped that the memorandum would form a useful basis for precise governmental legislation.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

(Above) Air Chief Marshal Sir Francis J. Fogarty, Air Member for Personnel, arriving by Sycamore at Halton, where he was reviewing officer at the passing out parade of the 70th Entry to No. 1 School of Technical Training. (Below) The Halton prizewinners: L/App. R. J. Shergold, Pioneer Trophy; Sgt/App. F. R. Crooks, Crebbin-Robinson Cup; Cpl/App. M. J. Evans, Elliott Memorial Prize; Sgt/App. J. J. Mitchell, Quinton Memorial Trophy; A/App. M. A. B. Siddiques, Azhar Memorial Shield.

R.A.F. Appointments

AFTER having been for the past two years Air Commodore in charge of Operations at Fighter Command, A. Cdre. J. Grandy, D.S.O., has been appointed to the post of Commandant of the Central Fighter Establishment. Another appointment is that of A. Cdre. M. L. Heath, O.B.E., who has just completed the 1954 course at the Imperial Defence College; he is to become Director of Plans.

A. Cdre. Grandy entered the R.A.F. with a short-service commission in 1931, and was granted his permanent commission in 1936. He led a squadron in the Battle of Britain, in which he was shot down. Later in the war, as a wing commander, he flew on operations in Burma.

A. Cdre. Heath was commissioned from Cranwell in 1927 and served with an army co-operation squadron in India. His war appointments included those of commanding No. 10 Gunnery School and the R.A.F. stations at Hetheringham and Wordhall.

Among other appointments recently announced by the Air Ministry are the following: In command, Act. G/C. A. G. Douglas, M.C., to the Aden Protectorate Levies; Act. W/C. A. S. Knowles, A.F.C., to the Central Servicing Development Establishment. For staff duties, G/C. T. F. U. Lang, A.F.C., to SHAPE; W/C. G. A. Bone to SACLANT. W/C. R. J. Alderson to Middleton St. George for technical duties and W/C. A. Beveridge to Halton for administrative duties. W/C. J. Kerr to No. 43 Group for administrative staff duties. W/C. W. S. G. Maydwell, D.S.O., D.F.C., to Western Army Command and W/C. H. A. Singer to Fighter Command, both for air staff duties.

A Lancaster Lost

ON December 17th a Coastal Command Lancaster from St. Mawgan, Cornwall, was lost 50 miles south-west of the Scilly Isles. An extensive search brought no news of survivors.

The seven men who have been posted as missing are: F/L. S. Rice (Captain), P/O. A. Meredith (second pilot), F/Sgts. R. A. Kemshall and W. A. Clare, and Sgts. T. J. Burgess, P. Leitch and T. J. Robertson.

H.M.A.S. Melbourne

THE Australian Minister for the Navy, Mr. Francis, recently stated that an Australian Naval party had already left for England to assist in commissioning H.M.A.S. *Melbourne*, the new aircraft carrier which will replace *Vengeance*, now on loan from the Royal Navy.

A number of aircrew are due to leave for Britain shortly for training courses on D.H. Venoms and Fairey Gannets, with which *Melbourne* will be equipped.

No E.P.T.S. Command Change

CONTRARY to our comment in a picture caption last week, G/C. S. Wroath has not been posted from command of the Empire Test Pilots School; and G/C. D. C. McKinley, who we understood would become the next Commandant, has in fact been appointed to command the Experimental Flying Department, R.A.E., in succession to G/C. Hughes.

No. 1 Radio School Parade

THE reviewing officer at the passing-out parade of the 70th Entry to No. 1 Radio School, Locking, Somerset, was Air Marshal Sir Victor E. Groom, K.C.V.O., K.B.E., C.B., D.F.C., A.O.C.-in-C. Technical Training Command.

After the parade he presented the prizes, the winners of which were as follows:—*Air Radio Fitter*, Cpl. A/App. B. G. M. Richtering; *Ground Radar Fitter*, A/App. L. E. Watten; *Ground Wireless Fitter*, Cpl. A/App. C. A. A. Brain and A/App. Soe Win Myint.

Sgt. A/App. H. M. Spencer took the three prizes for *Highest Educational Marks*, *General Service Subjects* and *Highest Aggregate Marks*.

Reunion

A REUNION of No. 825 Squadron R.N. will be held at 1900 hr, January 8th, at the Chandos Hotel, St. Martin's Lane, London, W.C.2. Tickets from P. W. Brooks, "The Pightle," Ford, near Aylesbury, Bucks.

Air Marshal Sir Victor E. Groom inspects No. 2 Flight of the 70th Entry to No. 1 Radio School. Behind him is A. Cdre. R. L. Phillips, and they are escorted respectively by F/Sgt/App. Manners and Sgt/App. King.

ROYAL AIR FORCE POLAR FLIGHTS

ALL the long-distance flights made by students of the Flying College into Arctic regions up to last July were started from R.C.A.F. bases in Canada or from U.S.A.F. bases in Greenland and Alaska (*via* Iceland). There are, however, administrative and operational advantages in the new practice of making the flights from Norway. The return flight from Norway to the North Pole is 1,000 miles longer than that from Thule, Greenland, or from Alaska Bay—but this is accepted as providing just the type of training conditions required for students of the calibre of those at the Royal Air Force Flying College, where officers of squadron leader rank and above are prepared for air staff and command appointments. Such a long-range flight in a jet aircraft is a test of the machine and equipment as well as of human skill, for it involves using both to capacity—the "limit flying" which it is the specified task of the Flying College to pioneer and achieve.

The navigational training techniques now being adapted to jet-aircraft operation for these high-latitude flights were originally evolved in the early flights into Arctic regions by long-range piston aircraft of the Flying College and, before that, of the Empire Air Navigation School at Shawbury. The principal rôle in these flights was that played by the famous *Aries* series of aircraft, beginning with a spectacular flight over both the geographic and magnetic North Poles by *Aries I*, a modified Lancaster aircraft of the Empire Air Navigation School, two days after V.E. Day. Further polar and arctic flights were made in *Aries III*, which was taken over by the R.A.F. Flying College on its formation in 1949, and in a number of Hastings transport aircraft manned largely by students of the College.

It was only in February last, however, that the first jet-aircraft operational and navigational arctic proving trials were carried out from Manby, when the Canberra *Aries IV* made the first flight by a British jet aircraft to latitude 75 deg N, and tested out for the first time whether the navigational techniques used on piston aircraft in these regions were applicable to the high speeds and high altitudes of jet aircraft.

On this first arctic jet flight, which was made from Canada, *Aries IV*, piloted by W/C. C. S. G. Stanbury, D.S.O., D.F.C., syndicate leader, made what the crew described as an "uneventful" flight. Navigation was checked by the sun, the flight being made in daylight. The thermometer at 45,000ft showed 78 deg of frost (−46 deg F) compared with 127 deg of frost over the Azores on the Atlantic crossing. Ground temperature at Churchill, Alaska, was only 10 deg higher than this and the presence of wind caused a "chill factor" of 2,100 or so compared with the maximum of 1,800 considered practicable for outside work by ground crews unless extraordinary precautions are taken.

The trickiest flight of this exercise was from Ottawa to Churchill, on the outward journey. This was because the nearest diversion point was Winnipeg, some 500 miles away; the Canberra had to circle Churchill for an hour to use up its surplus fuel, the Arctic sky being anxiously watched in the hope that landing conditions meanwhile remained possible. Ultimately a diversion proved unnecessary.

During the second arctic jet flight, which was made from Norway to the Geographic Pole, the aircraft reached a height of ten miles and encountered −76 deg F, equal to 108 degrees of frost, but still not so severe a temperature as over the Azores, owing to the increased height of the Tropopause (the lower boundary of the stratosphere, and from which point temperature ceases to fall with height) as the equator is reached.

The most difficult part of the trip was the return to Norway, a diversion being necessary to Bodö, low cloud making a landing impossible at Bardufoss, which is encircled by high ground, and this diversion leaving a very small reserve of fuel in the event of an emergency. As the flight was made by night it was necessary to navigate by the stars, for which purpose precise instrument-flying for periods of up to 14 minutes at a time was necessary while the navigators took their astro-shots. The pilot on this occasion was W/C. A. H. Humphrey, O.B.E., D.F.C., A.F.C., Senior Instructor, who had flown as co-pilot in *Aries III* on its first polar flight from Manby. The navigators were S/L. D. Bower, M.B.E., who has now made more than half a dozen Polar flights, and F/L. F. R. Wood.

A. Cdre. G. A. Walker, C.B.E., D.S.O., D.F.C., A.D.C., the Commandant of the R.A.F. Flying College, personally led the detachment which surveyed Norway for this flight.

The first arctic jet training flights on which students from the Flying College were engaged took place between December 13th and 17th, during which period 10,000 miles was flown in four flights within the Arctic Circle in 22 hours.

The first three flights were made due north from Bodö to latitude 85 deg N, on December 14th and 15th. (This compares with the position of the magnetic North Pole at latitude 76 deg N longitude 101 W.)

A further flight, scheduled for the night of December 15/16th, was cancelled because of unfavourable conditions, but the last and longest of the series took place as planned on December 16th, to latitude 87 N, or only 210 miles short of the Pole.

All the flights took place over Spitzbergen, the northern tip of which lies 900 miles inside the Arctic Circle. This entailed flying over a total of 9,000 miles of open sea and pack ice, of which 3,000 miles was over the Arctic Ocean north of Spitzbergen, and the remaining 6,000 over the open water of the Norwegian and Barents Sea between Spitzbergen and the Norwegian coast.

The fastest flight was the third in the series, when the Canberra flew some 2,400 miles to latitude 85 N and back in about five hours, giving an average ground speed of 480 m.p.h.

On this flight, which was at about 45,000ft, the weather was clear and fine. The pilot was W/C. W. J. Burnett, D.S.O., D.F.C., and the student navigators Lt. Col. C. A. North, U.S.A.F., and S/L. J. Tipton, D.F.C., who had previously flown together as co-navigator on a college flight in a Hastings which actually passed over the North Geographic Pole last July [as related by a passenger, Frank Beswick, M.P., in an article in *Flight* of August 13th].

Pilots on the other flights were W/C. M. D. Lyne, A.F.C., the leader of the detachment, and F/L. H. L. Mellor, A.F.C., staff instructor pilot. Altogether, five navigation students took part in the exercise, the others being S/L. D. Clare, D.F.C., S/L. M. C. Bunting, M.B.E., and S/L. G. Sproates. The whole detachment (numbering 20 with ground crew and student navigators) flew out to Norway in a Hastings piloted by W/C. Burnett, from Manby.

The Canberra was piloted to Norway by W/C. Lyne with S/L. D. Bower, M.B.E. (senior navigation instructor at Manby and officer in charge of navigation on the exercise) as his navigator. The signals officer for the detachment was F/L. D. T. Beresford.

This is the eighth exercise carried out into Arctic regions by aircraft of the R.A.F. Flying College since the first by the College in 1950. Of these, seven have been over the North Geographic Pole.

Flights in Chronological Order

Listed below are all the flights over the North Magnetic and Geographic Poles carried out from the R.A.F. Flying College, Manby, and the E.A.N.S., Shawbury:—

May 1945.—Polar research flight led by W/C. D. C. McKinley, D.F.C., A.F.C. (now Group Captain) in *Aries I*, a modified Lancaster, of the Empire Air Navigation School, Shawbury, two days after V.E. Day: (a) Iceland, N. Geog. Pole, Iceland; (b) Iceland, Magnetic Pole, White Horse.

1947-1949.—Numerous flights by E.A.N.S. Shawbury from Iceland up the Greenland coast to 80 deg N and to Spitzbergen.

July 1950.—Flight over N. Geog. Pole by two Hastings aircraft of the R.A.F. Flying College, Manby; two A.T.C. cadets carried.

July 1951.—Flight over N. Geog. Pole led by W/C. R. T. Frogley, O.B.E., D.F.C., with W/C. A. H. Humphrey, O.B.E., D.F.C., A.F.C., as co-pilot; aircraft was Lincoln *Aries III* (taken over from E.A.N.S. 1949) of the R.A.F. Flying College, Manby. Routes: (a) Iceland, N. Geog. Pole, Fairbanks (Alaska); (b) Fairbanks, Manby (*via* N. Mag. Pole). Arctic flights also made by four Hastings aircraft of the College.

September 1952.—*Aries III* (S/L. J. T. Lawrence, A.F.C.)—flight over N. Geog. Pole: Iceland, Pole, Thule. Two Hastings manned by Flying College course personnel: Iceland, Resolute Bay (Mag. Pole), Manby.

April 1953.—Flight over N. Geog. Pole by two Hastings manned by staff and students of No. 11 spec. "N" course: Resolute Bay, Pole, Resolute Bay.

July 1953.—Flight to N. Geog. Pole in two Hastings aircraft manned by Flying College staff and course personnel, led by A/Cdre. S. R. Ubee, C.B., A.F.C.: Thule, Pole, Thule.

February 1954.—Canberra *Aries IV*: First Arctic proving flight by British jet aircraft. Made from Churchill. Pilot, W/C. C. S. G. Stanbury, D.S.O., D.F.C.

July 1954.—Flight to N. Geog. Pole by two Hastings aircraft. Leader, A/Cdre. G. A. Walker, C.B.E., D.S.O., D.F.C., A.D.C. Route: Bodö, Pole, Bodö.

October 1954.—First flight over N. Geog. Pole by British jet aircraft: Canberra *Aries IV*, piloted by W/C. A. H. Humphrey, O.B.E., D.F.C., A.F.C. Route: Bardufoss, Pole, Bodö.

December 1954.—Canberra *Aries IV*. First Arctic exercise by jet aircraft in which R.A.F. Flying College students took part. Detachment led by W/C. D. Lyne, A.F.C.

Other R.A.F. Polar Operations.—Transport and Coastal Command operations in support of the British North Greenland Expedition, 1951, 1952, 1953 and 1954; R.A.F. component of British Scandinavian Antarctic Expedition—reconnaissance and support by two Auster 6 aircraft in region of Queen Maud Land (R.A.F. commander, S/L. G. B. Walford), 1949-50.

THE INDUSTRY

Gloster "Experimental" Dinner

AT the ninth annual dinner of the Experimental Flight Department of the Gloster Aircraft Company, held in Gloucester on December 17th, Mr. R. W. Walker, chief designer and director, said that the lack of prototypes of the Javelin handicapped the company in the early stages, and it was not until the beginning of this year that a machine was available which represented "all that would go into production." He forecast that the Javelin would have a long life and mentioned further developments that were vital to the defence of this country. Mr. Walker also thanked chief test pilot "Dickie" Martin for the "wonderful work" he had done and the inspiration he had given. Among guests at the dinner were former test pilots Mike Kilburn, Bill Waterton and Peter Cadbury.

Mr. Eric Greenwood, technical sales and publicity manager, gave some news of S/L. Jan Zurakowski's accident in a CF-100 earlier this year. It appears that some trouble had been experienced with the ejector seat in this aircraft, with the result that when "Zura" baled out he struck his knees badly on the cockpit combing. On the way down he noticed that his legs were in such a condition that he decided to land on one, which—being the calm, quick-thinking man that he is, said Mr. Greenwood—was just the sort of thing he would do.

Power Saw for Crash Rescue

A SPECIAL hand-held power saw for cutting escape holes in the fuselages of crashed aircraft has been developed by Black and Decker, Ltd. In many cases where crashed aircraft have trapped passengers in the cabin (the recent Constellation accident at Singapore is an example), it is vital to be able to cut a hole in the fuselage as rapidly as possible. Up till now it has only been possible to use axes, shears or heavy grapnels, which are relatively slow and difficult to use. A large axe, wielded by a strong man, makes a jagged hole, is slower and has nothing like the penetrating power of the saw.

It was demonstrated at London Airport last week that the new power saw could be used to cut a complete section about 3ft square out of a typical aircraft fuselage in about 15 seconds. For demonstration purposes, a derelict Valetta fuselage was used and two such large panels were cleanly cut away. The great advantages of the power saw, apart from its speed of operation, are the ease of handling, the cleanness of the hole which it cuts, and the fact that the hole is large enough to permit the release of several people at a time, and even a loaded stretcher, if required.

Mr. John Profumo, Parliamentary Secretary to the M.T.C.A., was present at the demonstration and himself easily made several rapid cuts in the Valetta fuselage, though he had had no previous experience of the tool. The whole equipment can be stowed in the back of a standard 15-cwt rescue vehicle, the electrically driven saw being attached by sections of cable totalling up to 200 to 300ft in length, which supply electrical power delivered by a 110-volt generator set. Resembling a woodcutter's circular saw, but weighing only 19 lb, the equipment is driven by a 110-volt D.C. 2 h.p. motor with a no-load speed of 3,700 r.p.m. The maximum depth of cut is 4½in, which will penetrate the inner skin of all current types of pressurized aircraft, including any interior trim or upholstery. A 3ft by 2ft 3in section has been cut out of a typical modern airliner fuselage panel in 15 seconds.

Power rescue-saw equipment, it is stated, may be issued to the crash rescue services at London Airport by next March, and further orders are foreseen. Black and Decker, Ltd., whose factory is at Harmondsworth, Middlesex, are also proceeding with experiments in driving rescue-saws with high frequency motors of the 200-cycle, three-phase, 3 h.p. type.

Vickers Appointments

THE following are the details of the appointments and reappointments within the Vickers organization, reference to which is made on page 921 of this issue.

Sir James Reid Young, C.A., F.C.I.S., having reached retirement age, relinquishes his executive duties and his seats on the Boards of subsidiary companies of Vickers, Ltd.; he remains a director of Vickers, Ltd., and Metropolitan-Cammell Carriage and Wagon Co., Ltd.

Viscount Knollys, G.C.M.G., M.B.E., D.F.C., who joined the Board in September 1952, is appointed deputy chairman of Vickers, Ltd. Maj-Gen. C. A. L. Dunphie, C.B., C.B.E., D.S.O., is appointed chairman of Vickers-Armstrongs, Ltd., retaining his present office of managing director.

Mr. E. J. Waddington, A.C.A., who relinquishes the office of secretary, joins the Board of Vickers, Ltd., and is appointed director of administration of that company. His post of director of administration of Vickers-Armstrongs, Ltd., is extended to that of director of finance and administration.

Vice-Admiral Sir Charles Simeon, K.B.E., C.B., relinquishes his seat on the Board of Vickers-Armstrongs, Ltd., having reached retirement age.

Mr. E. P. Tomlinson, A.C.A., is appointed secretary of Vickers, Ltd., from January 1st, 1955, in place of Mr. E. J. Waddington.

IN BRIEF

The aircraft division of Helliwells, Ltd., has moved from Walsall Airport to Birmingham (Elmdon) Airport, Sheldon, Birmingham 26 (Sheldon 2441).

* * *

British Insulated Callender's Cables, Ltd., announce the appointment of Mr. P. R. Dunn, B.Sc., M.I.E.E., as chief engineer. He succeeds Mr. D. T. Hollingsworth, who has recently been appointed to the Board of the company.

* * *

To meet increasing overseas commitments, Teddington Controls, Ltd., have appointed Mr. V. M. G. Bennett their overseas liaison engineer, in which post he will concentrate on foreign sales. For the past six years he has acted in technical liaison with the aircraft industry from the company's London office at 51, Brompton Road, S.W.3, and he will continue to have his headquarters there.

* * *

From the firm of Proportional Instruments, 14 St. James' Street, Brighton 1, come details of set-squares (45 deg. 8in and 60 deg, 10in) made in red transparent Perspex. On each square two edges only are bevelled, the base edge being left square in order to prevent slipping over the T-square edge. In addition, one edge is printed with an engraved scale in eighths of an inch.

* * *

In order to handle expanding business with their rotary mechanical seals, Flexibox, Ltd., of Trafford Park, Manchester, are forming an associated company in France. Known as Flexibox, s.a.r.l., the new company will have offices and works at 40, Avenue de Verdun, Croissy-sur-Seine. For some months past a German associated company, Flexibox G.m.b.H., has been in production at Hamburg. During the past year the area of the parent works in England has been increased by 50 per cent.

On December 17th the name of the Anglo-Iranian Oil Co., Ltd., was changed to the British Petroleum Co., Ltd. Addresses (Britannic House, Finsbury Circus, London, E.C.2, and Beaufort House, Gravel Lane, London, E.1) remain unchanged; the telegraphic addresses for general business are now "Beepee, Telex, London," and "Beepee, London" (foreign); the B.P. Aviation Service telegraphic address remains unchanged.

New appointments to the technical staff of Aviation and Engineering Products, Ltd., of Hounslow, include (left) Mr. H. Geen, A.F.R.Ae.S., as assistant chief designer, and Mr. W. J. Woods, B.Sc., A.F.R.Ae.S., G.I.Mech.E., as chief stressman. Mr. Geen was formerly chief technician of the London aircraft design office of English Electric, while Mr. Woods was deputy chief stressman in Short Bros.' London design office.

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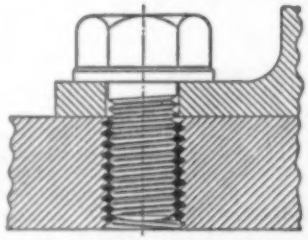

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM British European Airways of Keyline House, Ruislip, Middx:—

APPLICATION No. 436 for a Normal Scheduled Service with Viscount and Elizabethan aircraft for the carriage of passengers, supplementary freight and mail between Manchester (Ringway) and Milan with an optional intermediate traffic stop at London at a frequency of from two to seven services weekly initially during the season from June to September inclusive each year, for a period of ten years, commencing 1st June, 1955.

APPLICATION No. 437 for a Normal Scheduled Service with Viscount and Elizabethan aircraft for the carriage of passengers, supplementary freight and mail between Manchester (Ringway) and Barcelona and/or Palma with an optional intermediate traffic stop at London at a frequency of from two to seven services weekly initially during the season from June to September inclusive each year, for a period of ten years, commencing 1st June, 1955.

APPLICATION No. 438 for a Normal Scheduled Service with Viscount and Elizabethan aircraft for the carriage of passengers, supplementary freight and mail between Manchester (Ringway) and Nice at a frequency of from three to seven services weekly initially during the season from June to September inclusive each year, for a period of ten years, commencing 1st June, 1955.

APPLICATION No. 439 for a Normal Scheduled Service with Viscount aircraft for the carriage of passengers, supplementary freight and mail between London and Athens with an intermediate traffic stop at Milan at a frequency of from two to seven services weekly during the period from 1st April, 1955, to 31st March, 1965.

APPLICATION No. 442 for a Normal Scheduled Service with Viscount and Elizabethan aircraft for the carriage of passengers, supplementary freight and mail between London Airport and Vienna with an optional intermediate traffic stop at Munich at a frequency of seven services weekly, increasing if necessary, in accordance with traffic demand, during the period from 1st April, 1955, to 31st March, 1965.

APPLICATION No. 443 for a Seasonal Normal Scheduled Service with Viscount and Elizabethan aircraft for the carriage of passengers, supplementary freight and mail between Birmingham (Elmdon) and Nice at a frequency of from two to seven services weekly during the season from April to October inclusive each year for a period of ten years, commencing 1st April, 1955.

APPLICATION No. 440 from Air Charter, Ltd., of 15 Great Cumberland Place, London, W.1, for a Vehicle Ferry Service, with Bristol 170 aircraft, for the carriage of vehicles, passengers and supplementary freight between Southend and Ypenburg and/or Rotterdam, at a frequency of one service daily, increasing according to traffic demand, for a period of ten years, commencing three months from date of approval.

APPLICATION No. 441 from Cambrian Air Services, Ltd., of Cardiff Airport, near Barry, Glam., for a Seasonal Inclusive Tour Service, with Dakota aircraft, in conjunction with Thomas Cook & Son, Ltd., for the carriage of passengers and supplementary freight, between Cardiff (Rhoose) and Tarbes (for Lourdes) with intermediate traffic stops at Bristol (Whitchurch) and Southampton (Eastleigh) at a frequency of one service weekly, increasing according to traffic demand, during the season from May to September inclusive each year, for a period of ten years, commencing 1st May, 1955.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [3071

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DUTIES: Development and design of general physical and particularly optical instruments for aerodynamics research.

QUALIFICATIONS: University degree of high standard in physics or equivalent qualifications and preferably some experience in optical instrumentation.

THE salaries quoted are Australian currency.

WHERE permanent appointment is accepted, the successful applicant will be eligible to become a contributor to the Commonwealth Superannuation Scheme.

UNDER specified conditions, first class boat fare (if first class berth available) of the appointee and his dependents (wife and dependent children) will be paid by the Commonwealth.

SALISBURY is situated 16 miles from Adelaide, the capital of South Australia.

APPLICATION forms obtainable from

THE SENIOR REPRESENTATIVE (A.P.23)
Department of Supply,
Australia House, Strand,
London, W.C.2.

with whom applications should be lodged by January 20, 1955. [3077

MINISTRY OF SUPPLY: Air Traffic Control Officers. The Civil Service Commissioners invite applications for the following posts:—

(a) One pensionable Grade II post and and pensionable Grade III post at Royal Aircraft Establishment, Farnborough, Hants.
(b) One Grade III pensionable post at National Aeronautical Establishment, Bedford.
(c) Three Grade III non-pensionable posts at Royal Aircraft Establishment, Farnborough, Hants.

AGE for Grade II post at least 28 years; for Grade III posts at least 23 and under 35 years on 1st January, 1955. Candidates must have reached the standard of education represented by the pre-1951 School Certificate with matriculation exemption or its equivalent in terms of the General Certificate of Education or Scottish Leaving Certificate, or hold an appropriate technical qualification. They must have had experience either as (a) aircrew in civil air transport, preferably as pilot or navigator, with considerable experience in the United Kingdom, or (b) pilot or navigator in the Armed Forces, preferably with considerable experience of air traffic control in the United Kingdom. Exceptionally, candidates without aircrew experience will be considered, provided they meet the educational requirements given above, and have had considerable practical experience either in civil aviation or in the Armed Forces of duties directly concerned with the operation of air traffic control. Additional assets will be a general knowledge of civil aviation legislation and practice, and of radio and radar aids to navigation, and working knowledge of the French language. Grade II salary £1,021 by annual increments to £1,190. Starting salary for Grade III according to age, from £507 (at 23) to £776 (at 30 or over) rising to maximum of £1,021. Somewhat lower for women. Further particulars and application forms from Civil Service Commission, Burlington Gardens, London, W.1, quoting No. 4412/55. Completed application forms to be returned by 13th January, 1955. [3073

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Vacancies exist for technical staff on stress and general mechanical and structural engineering work on Gas Turbine Engines.

Apprenticeship and Higher National Certificate standard in either Mechanical, Structural or Aeronautical Engineering are minimum requirements. Preference will be given to young qualified engineers who have completed National Service.

Applications, quoting **E.D. 24**, giving details of age, experience and qualifications, should be addressed to the

Personnel Manager,
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SENIOR ENGINEER INSPECTORS

THE work will require close liaison with flight trials and design engineers and may involve participation in trials away from base.

APPLICANTS should have H.N.C. (Electrical) or equivalent qualifications and have several years' experience covering two or more of the following:—

(1) Electronics (D.C. amplifiers, pulse circuits or microwaves).
(2) Gyros.
(3) Hydraulics.
(4) Servo systems.

THESE are senior appointments carrying attractive salaries and are pensionable after qualifying period. Housing assistance can be given to successful applicants normally resident in the Greater London Area. Applicants to Dept. C.P.S., 336/7, Strand. W.C.2, quoting Ref. 1355E. [3002

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require:

Draughtsmen (Senior and Junior)

preferably with aircraft experience. Men with mechanical, structural and electrical drawing experience also considered.

Jig and Tool Draughtsmen

for designing machine fixtures, assembly tools and jigs.

Aircraft Planners
Ratefixers
Estimators

and

Inspectors.

Write giving full particulars including age and salary required for Personnel Dept., South Marston Works, Swindon, Wilts. [2952

AIRCRAFT STRUCTURAL ENGINEERS

TWO senior men with good qualifications are required for interesting structural design work mainly concerned with high speed projects. These are senior appointments and only men with the following should apply:—

FOR post (a)—good academic qualifications, wide experience in detail design and stress analysis, knowledge of modern workshop processes, ability to lead a group.

FOR post (b)—high academic qualifications, experience in research on new forms of construction and methods of stress analysis and a capacity for supervision.

ATTRACTIVE salaries will be paid to the men finally selected and suitable unfurnished accommodation will be made available soon after the commencement of employment.

WRITE, giving details of age, experience, qualifications, etc., to Box 31, M 3091 A. K. Advg., 212a, Shaftesbury Avenue, London, W.C.2. [3001

IF you have aircraft design experience and would like to explore the possibilities of working and living on the Isle of Wight, you have only to send a postcard for an application form to the address below.

WE would be pleased to hear from anyone qualified for employment in any of the following capacities:—

DRAUGHTSMAN
(Structural, Mechanical or Full-Scale Layout),
STRESSMAN,
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AERODYNAMICIST,
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PROJECT ENGINEER.

WE are able to offer assistance with accommodation, participation in pension and assurance schemes and a salary in accordance with experience and qualifications.

THE PERSONNEL DEPT. (Ref. F/19),
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EAST COWES, I.o.W. [3035

DEVELOPMENT ENGINEERS

REQUIRED for interesting work in London area on development and testing of new methods of aircraft and helicopter construction and materials. H.N.C. or equivalent and experience of development work or in drawing office or technical office are basic essentials. Applicants should write to Box 0768 and quote reference DE/C. [3047

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(AIRCRAFT DIVISION)

require

(e) Technical Liaison Engineers in the Civil Aircraft Servicing Department. Applicants should be about 30 to 35 years of age, well educated, including an apprenticeship or similar training, and have had some experience on aircraft design.

(f) Aircraft Servicing Engineers with A.R.B. licences, endorsed for Viking, and/or four-engined aircraft, for representatives' work on airframe or civil aircraft in this country and overseas.

Applications, quoting date and prefix letter of advertisement, to:

Employment Manager,
Vickers-Armstrongs, Limited,
Weybridge Works,
Weybridge, Surrey.

Weybridge is 30 minutes from London on the main Waterloo/Portsmouth line.

Additional buses operate to and from the works at starting and finishing times.

Canteen facilities.

Applicants should be in a position to arrange their own housing accommodation. Assistance can only be given with individual lodgings.

SITUATIONS VACANT

TECHNICAL ASSISTANTS FOR FLIGHT AND PERFORMANCE

ARMSTRONG SIDDELEY MOTORS require young engineers interested in tests covering performance measurement, handling and control behaviour, analysis of flight test data, prediction of engine performance and the functional side of engine behaviour. Applicants must possess a Degree or Higher National Certificate in Mechanical Engineering. Applications, quoting reference CG/FP3, to the Technical Personnel Manager, Armstrong Siddeley Motors, Coventry. [3058

AIRCRAFT VIBRATION ENGINEERS

MALE or female engineers, having a good mathematical background, are invited to apply for intermediate appointments in a section engaged on flutter and vibration analysis on modern high speed aircraft. WRITE stating age, experience, etc., or send P.C. for application form, to the Personnel Department (Ref. F/18), Saunders-Roe Limited, East Cowes, I.O.W. [3000

ROCKET Experimental Division.

(1) A young energetic man with a degree or Higher National Certificate is required to work on the design of test rigs and provision of all equipment needed for testing rocket engines.
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APPLY to Reference CG/RD4, Technical Personnel Manager, Armstrong Siddeley Motors, Coventry. (Please state which section of the advertisement you are interested in.) [2947

ONE "D" licence engineer required with experience on light aircraft engines.

APPLY, Chief Engineer, Derby Aviation, Ltd., Derby Airport, Derby. [3007

TECHNICAL assistants are required for the headquarters staff of the service department of The de Havilland Engine Company, Limited. Work will be mainly connected with the preparation of technical and modification news sheets.

APPLICANTS should be preferably over 30 years of age, and should have a good engineering background with previous experience of this type of work. Written applications only to the Personnel Officer, The de Havilland Engine Company, Ltd., Leavesden Aerodrome, near Watford, Herts. [3059

VICKERS-ARMSTRONGS
LIMITED
(AIRCRAFT DIVISION)
require:—

(g) **AIRCRAFT PERFORMANCE ENGINEER** (Aerodynamicist) with at least two years experience, for work in connection with operational route analysis, airworthiness, customers' requirements, etc. Applicants should be of Higher National Certificate or similar standard.
(h) **TECHNICAL INSTRUCTORS** (Electrical) for Aircraft Servicing School; must have had good technical training, sound practical experience in the electrical maintenance of modern aircraft, and be capable of lecturing, drawing instructional diagrams and compiling lecture notes for the use of students.
(i) **INSPECTORS** (Airframe and Electrical) for work on civil and military finals; also other branches of production and development. Applicants should state any ARB licences held—quoting groups.
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(k) **CLERKS,** of good ability for work in our Time, Wages, Accounts and Buying Offices. Previous experience of these particular types of offices not essential. Applicants should, however, be competent in figure work.

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WEYBRIDGE WORKS,
WEYBRIDGE, SURREY.

Weybridge is 30 minutes from London on the main Waterloo/Portsmouth line. Additional 'buses operate to and from the works at starting and finishing times. Canteen facilities.

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CHIEF purser steward required with experience of international air services. Preferably should have experience in checking cabin attendants and training in classroom. Salary Rs.1,500 per month with free unfurnished accommodation. Apply to.—
PAKISTAN INTERNATIONAL AIRLINES,
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London, S.W.1. [3055

A. V. ROE & COMPANY, LIMITED have the following vacancies in their Technical Publications Department:—

TECHNICAL authors are required for the preparation of descriptive and servicing manuals, servicing schedules, pilots' notes, etc. Candidates should have had experience of aircraft servicing and maintenance and special consideration will be given to ex-R.A.F. personnel. Applications are particularly required from men with electrical experience.

APPLICATIONS, giving full details of age, qualifications and experience, also salary required, should be addressed to the Labour Manager, A. V. Roe & Company, Limited., Greengate Middleton, Manchester. [3072

A. V. ROE & COMPANY, LIMITED, have the following vacancies in their Technical School, situated at Woodford Aerodrome, Cheshire.

(a) An instructor/airframes is required for lecturing on the servicing and maintenance of the Company's aircraft. Candidates should have had experience of aircraft servicing and maintenance and special consideration will be given to ex-R.A.F. personnel who are Halton trained men. Some experience of instructing will be an advantage, together with an up-to-date knowledge of modern aircraft.
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APPLICATIONS, giving full details of age, experience and qualifications, also salary required, should be addressed to the Labour Manager, A. V. Roe & Co., Ltd., Greengate, Middleton, Manchester. [3031

INSPECTORS required by Skyways, Ltd., at Bovingdon Airport. Experience on heavy aircraft preferably with "A" or "C" licences.—Telephone Bovingdon 2143 or write for interview to Administrative Superintendent, Skyways, Ltd., Bovingdon Airport, Hemel Hempstead. [3041

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Urgently require:-

AIRFRAME FITTERS

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Ex regular or National Service men required for Meteor Overhaul.

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(SENIOR & JUNIOR)

Consideration will also be given to Draughtsmen with Mechanical, Structural or Electrical experience.

Also

STRESSMEN
(SENIOR & INTERMEDIATE)
for both strength and flutter calculations.

The conditions of employment are good with progressive salary, good sports and welfare facilities, pension scheme, etc.

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holding A.L.T.P. LICENCE

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HOUNSLOW

TECHNICAL ENGINEER

Required for the London Aircraft Design Office of the Bristol Aeroplane Company. Technical Engineer to take charge of small section for aeroelastic and flutter investigations.

Qualifications required are an Honours Degree in Engineering or Mathematics and some experience in similar work.

The position will be a Senior Staff appointment and offers interesting work and opportunities to a suitable applicant. There are extensive pension and welfare schemes.

Applications, giving details of age, qualifications, salary and experience and quoting *D.O.28*, should be sent to

The Personne Manager
THE BRISTOL AEROPLANE CO. LTD.
Aircraft Division
FILTON HOUSE, BRISTOL

BLACKBURN & GENERAL AIRCRAFT LTD.
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Interesting work under good conditions. Contributory Pension Scheme and Life Assurance benefits. New houses at low rentals, adjacent to the works, can be made available early in 1955 to married men who join the Company from other areas after a satisfactory probationary period. Applications, giving details of age, experience, etc. (to be treated in strict confidence) should be addressed to the Personnel Manager at the above address. Mark envelope "D.O."

SITUATIONS VACANT

THE FAIREY AVIATION CO., LTD., have the following vacancies in the Engineering Development Dept.—

(a) Senior draughtsman to take charge of small drawing office responsible for design of simulator test rigs for aircraft and helicopter systems and also the design of special equipment for development of materials and constructional methods. H.N.C. in mechanical engineering and knowledge of structural stressing are necessary qualifications.

(b) Intermediate draughtsman for work in above drawing office. O.N.C. in mech. engineering or equivalent standard.

APPLICANTS should write giving details of experience, etc., to the Personnel Manager, The Fairey Aviation Co., Ltd., Hayes, Middlesex. [3061

CHIEF stressman is required by Normalair, Ltd., to be responsible for strength calculations in connection with aircraft pressurizing and air conditioning equipment, including cold air units and high altitude breathing equipment, and other new projects. An engineering degree or equivalent is essential.

APPLICATIONS, stating age, experience, qualifications and salary required, are to be addressed in the first instance to the Personnel Officer, Normalair, Ltd., Yeovil. [0347

SECRETARY/ACCOUNTANT (qualification desirable but not essential), aged 25/35, required for substantial new Aircraft Manufacturing Company, London area. Permanent and progressive position. Salary £700/£900 according to age and experience. Replies treated in confidence. Box 0781. [3056

WORKS cost accountant recently qualified (I.C.W.A. degree essential) required for substantial new Aircraft Manufacturing Company, London area. Permanent and progressive position. Salary £650/£750 according to age and experience. Replies treated in confidence. Box 0782. [3057

PRODUCTION foreman required for factory situated in Nottingham. Must be experienced in aircraft sub-assemblies, good disciplinarian and have a knowledge of modern production schemes. Please state full particulars to Box F876, LPE, 55, St. Martin's Lane, London, W.C.2. [3062

BERMUDA Aviation Services have two vacancies for licensed ground engineers. Preference given those having endorsements for Constellations, DC6 or Viscounts. Initial contract for three years. Free passage. Salary £1,050-£50-£1,150. Single men preferred.—Applications to be made to the Manager, Bermuda Aviation Services, Ltd., Bermuda. [3068

APPLICATIONS are invited for the post of chief engineer, East Bengal Aircraft Workshop. Qualifications: A, C, and B Licences endorsed for light aircraft and flying boats and several years aeronautical engineering experience and not less than one year as chief engineer or equivalent. Pay: Rs. 2,000 per month, housing and medical concessions. Provident Fund. Free passages. One rupee equals 2/2d approximately. APPLICATION forms and further particulars from the Recruitment Officer, Education Division, Office of the High Commissioner for Pakistan, 39 Lowndes Square, London, S.W.1. Last date for receipt of applications 28th January, 1955. [3050

JIG and tool draughtsman urgently required. Age 23-30. O.N.C. essential with experience on small aircraft. Assembly jigs, also small quantity sheet metal tooling. 5-day week.—Apply in writing, giving full particulars of age, experience and salary required, to Personnel Manager, Flight Refuelling Ltd., Tarrant Rushton Airfield, nr. Blandford, Dorset. [3029

H. M. HOBSON, LTD., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0420

COMMERCIAL assistant. Aircraft and Engine Equipment manufacturer requires commercial assistant. Experienced sales/supply office procedure aircraft industry. Age around 30, ex-R.A.F. preferred salary suitable to status. Transport and accommodation assistance available.—Write details education, experience, requirements to Box 0812. [3069

SENIOR and intermediate design draughtsmen urgently required, with experience on mechanical and precision engineering, for development work. Pleasant working conditions. 5-day week. Special buses at cheap fares from Bournemouth, Christchurch, Poole, Salisbury and Ringwood. Apply in writing to Personnel Manager, Flight Refuelling Ltd., Tarrant Rushton Airfield, nr. Blandford, Dorset. [3042

H. M. HOBSON, LTD., Hobson Works, Fordhouses, Wolverhampton, require a number of technicians for interesting development work on power operated flying control, hydraulic systems, and fuel metering systems. Preference will be given to applicants having previous experience of hydraulic systems, or to those of engineering degree or H.N.C. standard. —Apply stating age, experience and salary required. [3043

JUNIOR technical salesman required for the Aviation Division of Elliott Bros. (London) Ltd., to deal with fuel system components. Candidates should possess Higher National Certificate and have served a recognized apprenticeship in aircraft or aero-engines, whilst good knowledge of aircraft fuel and hydraulic systems, together with electrical background, essential. Successful candidate will be required to commence as a service engineer.—Applications, giving particulars of age, qualifications, experience, etc., to Personnel Officer, Century Works, Lewisham, S.E.13. [3032

BROOKLANDS AVIATION LTD.
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PRODUCTION ENGINEER

Experience on repair of Service aircraft essential. Good salary commensurate with ability and experience.

APPLY TO:
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Required for new Aero Engine Drawing Office situated in a central position in West End of London,

MECHANICAL ENGINEERING DRAUGHTSMEN

for Sheet Metal and Mechanical Engineering work. Previous aero engine experience not necessary.

INTERVIEWS will be held in London during the week and at week-ends, if desired.

GOOD SALARIES and excellent opportunities.

Full particulars, quoting E.D.25, to be forwarded to the

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THE BRISTOL AEROPLANE Co. Ltd.
Engine Division,
Filton House, Bristol.

THE FAIREY AVIATION COMPANY LIMITED
HEATON CHAPEL, STOCKPORT

require

STRESSMEN

with Degree or H.N.C., and not less than three years experience in Aircraft Industry

also

SENIOR and INTERMEDIATE DRAUGHTSMEN

Aircraft experience desirable.

Write, stating age and experience etc., to:—

The Employment Manager,
Heaton Chapel Works,
Stockport

SITUATIONS VACANT

LICENSED aircraft engineer with "A" licence up to 10,000 hrs. and "C" licence up to and including Cheetah X Engines. Apply in writing.—ADIE AVIATION LIMITED, Croydon Airport, Croydon, Surrey. [3054

CHIEF stressman, with good aircraft structural experience, required for super priority work by old established firm on South Coast.—Apply Box 0694. [3037

SENIOR and junior draughtsmen required for interesting work on remote control for aircraft and atomic equipment.—Apply in writing to Teleflex Products, Ltd., High Road, Chadwell Heath, Essex. [0720

WARDEN AVIATION require an engineer for C. of A. work on light aircraft. Must have good all-round experience. Accommodation available. Licences not essential. Apply Old Warden Aerodrome, Biggleswade. Tel. Northill 288. [3076

CERTIFIED engineer required for partnership in the north of England. Sale, maintenance, conversion and Cs. of A. for Geminis, Proctors, Rapides, etc. Capital and workshop available. Small capital required. Box 0823. [3075

ASSISTANT aerodynamicist required. Good salary and prospects for a man with aerodynamics and mathematics to degree standard. Industrial experience preferable but not essential. Applicants must be British by birth and free of National Service commitments. (Ref. 63.) Please write in detail, quoting Reference No. to: The Personnel Manager (Technical Employment), de Havilland Propellers, Limited, Hatfield, Herts. [3025

HOUSING assistance will be offered to chargehand fitter with wide production experience of aircraft type hydraulic installations required by manufacturers of materials handling vehicles. Pleasant country district, 1 hour London. Good prospects of advancement. Canteen and social facilities.—Please write giving details of age, qualifications, past experience, married/single, present salary, salary required to Box 0803. [3067

CHIEF jig and tool draughtsman required for large aircraft factory. Applicants who should be about 35 years of age must have served a full engineering apprenticeship and have had considerable recent experience in all phases of tool design for airframe manufacture. Good salary, pension scheme and permanency for right man.—Apply, giving age and full details of qualifications and experience to: Personnel Officer, Hawker Aircraft (Blackpool), Ltd., South Shore, Blackpool. [3034

REPRESENTATIVES required—one for aircraft electrical accessories and new development projects. Essential to have aircraft background and able to contact aircraft design sections. One for production liaison with engineering companies, aircraft manufacturers and the motor industry, to develop sale of accessories. Good salary, with full expense allowance will be paid to the right man. Write in confidence, in first instance, stating age, experience, etc., to Personnel Manager, Western Manufacturing (Reading) Limited, The Aerodrome, Reading, Berkshire. [3074

DERBY AVIATION, LTD., Derby Airport, Derby, require engine and airframe fitters, preference given to ex-R.A.F. and R.N.A.S. technicians. Mosquito experience an advantage. [3046

ELECTRICAL/ELECTRONIC Engineer. Vickers-Armstrongs Limited, Supermarine Works, require for employment at their experimental airfield, graduate with research and development experience in electronic and electromechanical devices and/or recording equipment for interesting work on ground and air-borne measuring apparatus; the right man for this post will be keen to suggest and assess new techniques and to design and engineer suitable and workmanlike equipment. Permanent pensionable post with good prospects for suitable engineer. Apply Personnel Department, Hursley Park, nr. Winchester. [3049

APPLICATIONS are invited for the post of Chief Pilot for Government of East Bengal Flight, Dacca, Pakistan. Qualifications: Pilot's B licence, minimum flying experience 3,000 hours with at least 1,000 hours as captain on multi-engined aircraft. Preference given to candidates with amphibian experience, instructor's licence, holders of 2nd class navigator's licence and instrument rating. Contract: Two years in first instance, terminable at three months' notice. Pay: in scale Rs. 1,600-75-1,750, Rs. 9.4 equals one pound sterling. Insurance: To cover air risks for Rs. 20,000 at present premium of existing insurance policies to maximum of Rs. 50 per month. Free accommodation or house rent at 10 per cent. of pay. Application forms available from the Recruitment Officer, Education Department, Office of the High Commissioner for Pakistan, 39 Lowndes Square, London, S.W.1. [3051

HUNTING-CLAN AIR TRANSPORT
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require
CAPTAINS
holding
A.L.T.P. LICENCE with YORK and VIKING or VISCOUNT ENDORSEMENTS
Reply in writing to: **Technical Manager**
HUNTING-CLAN AIR TRANSPORT LTD.
London Airport, Hounslow, Middlesex

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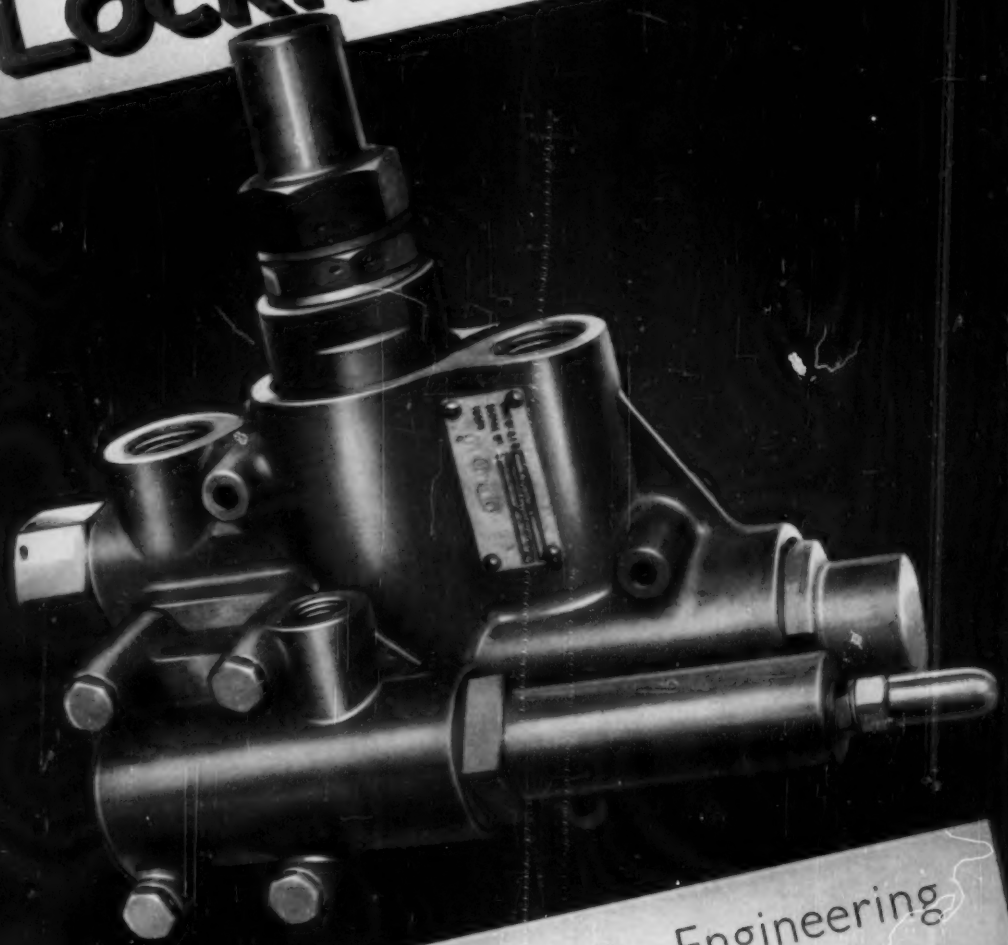

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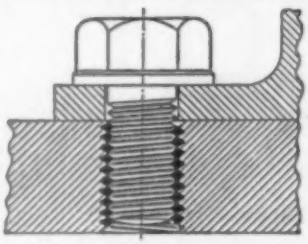

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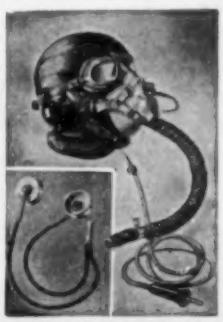

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM British European Airways of Keyline House, Ruislip, Middx:—

APPLICATION No. 436 for a Normal Scheduled Service with Viscount and Elizabethan aircraft for the carriage of passengers, supplementary freight and mail between Manchester (Ringway) and Milan with an optional intermediate traffic stop at London at a frequency of from two to seven services weekly initially during the season from June to September inclusive each year, for a period of ten years, commencing 1st June, 1955.

APPLICATION No. 437 for a Normal Scheduled Service with Viscount and Elizabethan aircraft for the carriage of passengers, supplementary freight and mail between Manchester (Ringway) and Barcelona and/or Palma with an optional intermediate traffic stop at London at a frequency of from two to seven services weekly initially during the season from June to September inclusive each year, for a period of ten years, commencing 1st June, 1955.

APPLICATION No. 438 for a Normal Scheduled Service with Viscount and Elizabethan aircraft for the carriage of passengers, supplementary freight and mail between Manchester (Ringway) and Nice at a frequency of from three to seven services weekly initially during the season from June to September inclusive each year, for a period of ten years, commencing 1st June, 1955.

APPLICATION No. 439 for a Normal Scheduled Service with Viscount aircraft for the carriage of passengers, supplementary freight and mail between London and Athens with an intermediate traffic stop at Milan at a frequency of from two to seven services weekly during the period from 1st April, 1955, to 31st March, 1965.

APPLICATION No. 442 for a Normal Scheduled Service with Viscount and Elizabethan aircraft for the carriage of passengers, supplementary freight and mail between London Airport and Vienna with an optional intermediate traffic stop at Munich at a frequency of seven services weekly, increasing if necessary, in accordance with traffic demand, during the period from 1st April, 1955, to 31st March, 1965.

APPLICATION No. 443 for a Seasonal Normal Scheduled Service with Viscount and Elizabethan aircraft for the carriage of passengers, supplementary freight and mail between Birmingham (Elmdon) and Nice at a frequency of from two to seven services weekly during the season from April to October inclusive each year for a period of ten years, commencing 1st April, 1955.

APPLICATION No. 440 from Air Charter, Ltd., of 15 Great Cumberland Place, London, W.1, for a Vehicle Ferry Service, with Bristol 170 aircraft, for the carriage of vehicles, passengers and supplementary freight between Southend and Ypenburg and/or Rotterdam, at a frequency of one service daily, increasing according to traffic demand, for a period of ten years, commencing three months from date of approval.

APPLICATION No. 441 from Cambrian Air Services, Ltd., of Cardiff Airport, near Barry, Glam., for a Seasonal Inclusive Tour Service, with Dakota aircraft, in conjunction with Thomas Cook & Son, Ltd., for the carriage of passengers and supplementary freight, between Cardiff (Rhoose) and Tarbes (for Lourdes) with intermediate traffic stops at Bristol (Whitchurch) and Southampton (Eastleigh) at a frequency of one service weekly, increasing according to traffic demand, during the season from May to September inclusive each year, for a period of ten years, commencing 1st May, 1955.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [3071

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THE SENIOR REPRESENTATIVE (A.P.23)
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AGE for Grade II post at least 28 years; for Grade III posts at least 23 and under 35 years on 1st January, 1955. Candidates must have reached the standard of education represented by the pre-1951 School Certificate with matriculation exemption or its equivalent in terms of the General Certificate of Education or Scottish Leaving Certificate, or hold an appropriate technical qualification. They must have had experience either as (a) aircrew in civil air transport, preferably as pilot or navigator, with considerable experience in the United Kingdom, or (b) pilot or navigator in the Armed Forces, preferably with considerable experience of air traffic control in the United Kingdom. Exceptionally, candidates without aircrew experience will be considered, provided they meet the educational requirements given above, and have had considerable practical experience either in civil aviation or in the Armed Forces of duties directly concerned with the operation of air traffic control. Additional assets will be a general knowledge of civil aviation legislation and practice, and of radio and radar aids to navigation, and working knowledge of the French language. Grade II salary £1,021 by annual increments to £1,190. Starting salary for Grade III according to age, from £507 (at 23) to £776 (at 30 or over) rising to maximum of £1,021. Somewhat lower for women. Further particulars and application forms from Civil Service Commission, Burlington Gardens, London, W.1, quoting No. 4412/55. Completed application forms to be returned by 13th January, 1955. [3073

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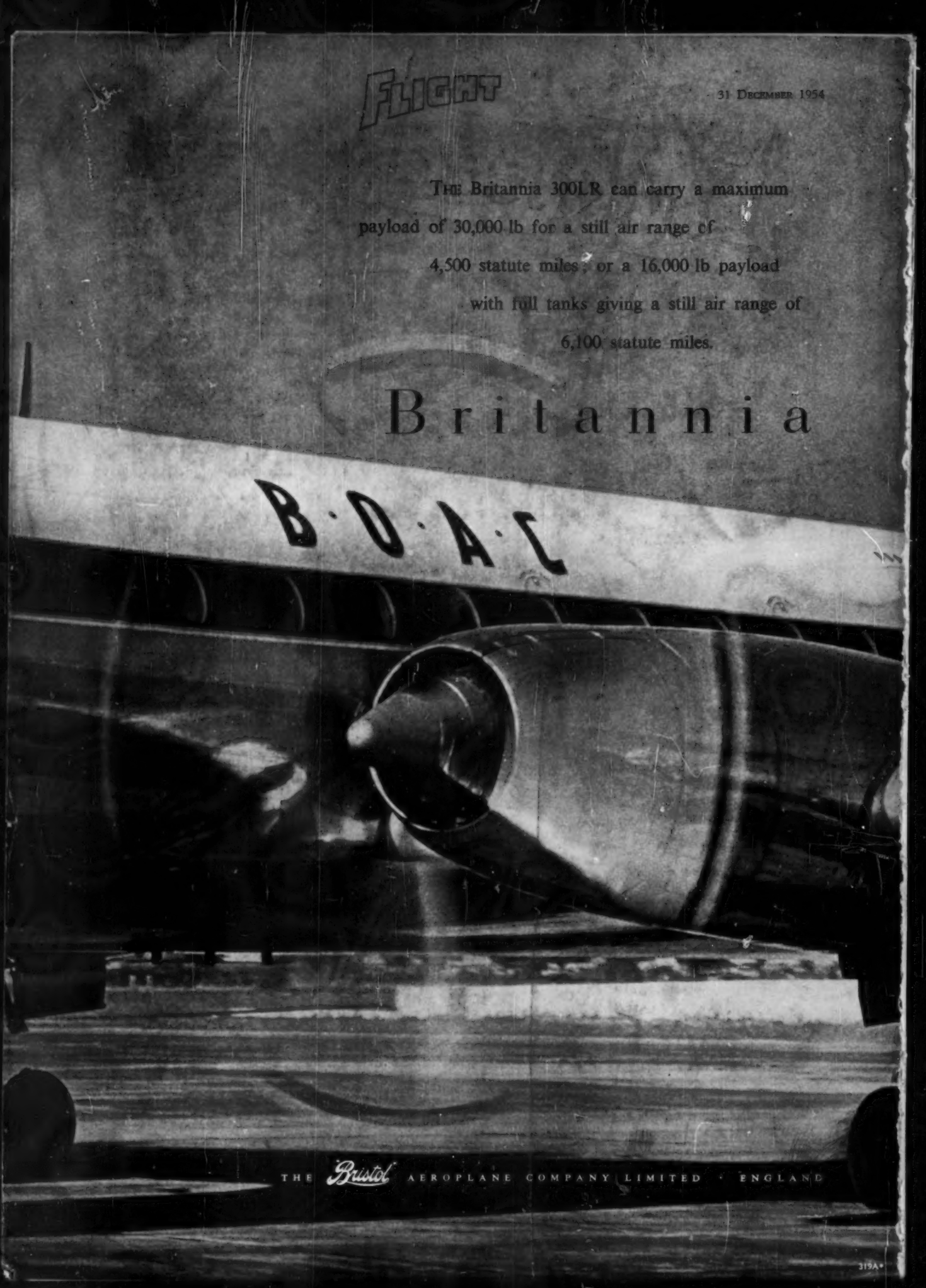

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